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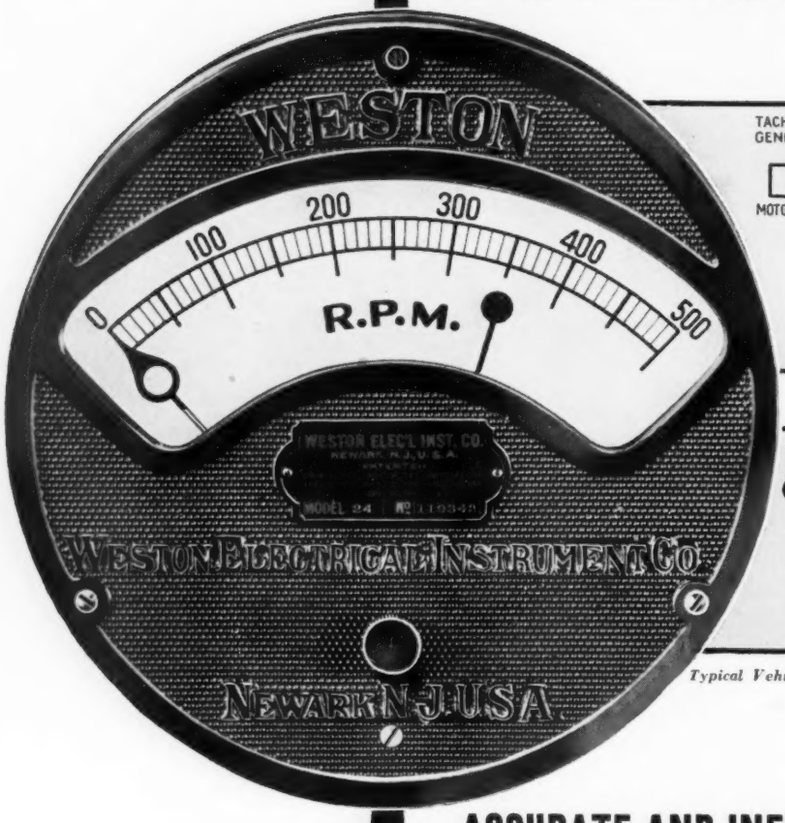

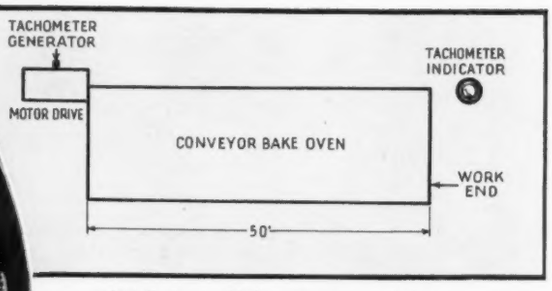

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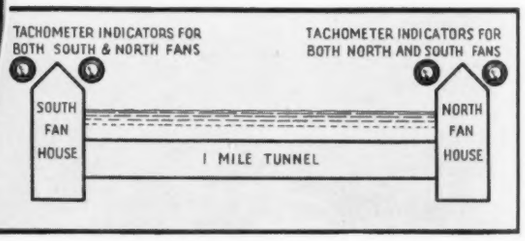
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THIS INDEX is merely a convenient guide. Many articles will appeal to several reader groups—many will apply to all. News and other departments are of general interest.

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August 4, 1934

L. W. W. MORROW, *Editor*

Insulation Resistance—How Low Can It Be Allowed to Fall?

For two or three years there has been discussion of the minimum standards for insulation resistance of electrical windings. A recent revision of the A.I.E.E. rule is evidence of the trend toward a more rational value than has long prevailed. Nevertheless, it is still manifest that a single rule or formula cannot possibly cover the wide range of speeds, voltages, ratings, grades of insulation and operating conditions which dictate the degree of insulation provided initially in the design. By the same token a single rule can hardly fix the limiting condition which should dictate inspection, cleaning or reinsulation. Nevertheless, simplicity of technique in maintenance calls for as simple a rule as possible. What to do?

Dielectrics are obstinate. Did we but know half as well as for conductors and magnetic materials the stages by which insulation approaches failure we could then formulate a single law for its progressive deterioration. Meanwhile, we take megohm readings on a d.c. basis and trust the indication is a significant guide to what has been happening since the insulation was at its best. Possibly the way to circumvent the stubbornness and temperamentality of dielectrics is to devise a new type of test instead of fudging the indications of the traditional one.

To the engineer who stands off and looks at insulation in perspective it would certainly be ideal if designers could follow the practice of the civil engineer in designing his bridges and other structures with reasonable and comparatively small factors of safety. Our electrical factors of safety are enormously larger to cover our ignorance of dielectrics. Every move made to supply this deficiency of knowledge will save dollars in unnecessary initial insulation and dollars in equipment failure and dollars in insurance against failure.

Discussion at the recent A.I.E.E. convention indicates that engineers are alive to this need. Recent advance in insulation testing methods, enabling failure of cables and bushings to be anticipated, presages the ultimate development of similar methods that should effectively forestall failures of machine insulation.

Power Policy and Politics

Not one man of demonstrated competence in the business of electricity supply is included in the recently announced national power policy committee. Yet that body is to "develop a plan for the closer co-operation of the several factors in our electrical power supply—both public and private—whereby national policy in power matters may be unified and electricity be made more broadly available at cheaper rates to industry, to domestic and particularly to agricultural consumers."

Some of those named have no association whatever with the electric power business. Others are linked in the public mind with the power question—as enemies of the electric utilities. To the hands of such a group goes, to a probable large measure, the determination of the governmental policy toward a major industry in which millions of American citizens have invested more than twelve billion dollars of their savings. Yet President Roosevelt on June 28 said: "The Administration needs and will tirelessly seek the best ability the country affords."

Is it because the country contains no competent electric utility operators that none could

be found for this very important committee? How other can one explain that national policy on electric power must be determined by lawyers, foresters and army officers? Yet it should be easy for any informed person to name a large number of men long experienced in the business of electricity supply, any one of whom could bring to the deliberations of this organization more seasoned judgment in electric power matters than could be boiled out of the entire present personnel.

Acres of Diamonds

Like the man who sought opportunity all over the world and found it in his own back yard, the power companies possess "acres of diamonds" unmined in the latent interests of their own stockholders. It is not a new thought. But this resource still lies undeveloped for most utilities.

The Central Maine Power Company had a recent experience that illustrates the point. Sixty per cent of its 19,000 stockholders live in the territory it serves. With a recent quarterly dividend, therefore, a letter was sent discussing electricity in the kitchen, an intimate comment from the president to the owners. Some 200 asked for more information, and as a result practically all purchased a refrigerator, a range or a water heater. Clear gain in load—but more than that. It means also 200 stockholders with a more personal interest in the company and its business, 200 more householders boosting for the convenience and economy of electric servants.

Stockholders are not responsive to political appeals. They do not rally to the defense of a company in which they happen to have invested money. Why should they? But they will respond to the appeal of self-interest, like anybody else. So the only sound approach is through service. For once a stockholder is enjoying electricity in his home, by the use of major appliances, he just naturally becomes enthusiastic and the rest follows.

A company may feel that it has a special claim on the stockholder, but the shoe is really on the other foot. The owner of securities feels himself entitled to special service and he is. Central Maine offered just this and was rewarded. These customers are now friends, not because they own stock but because they appreciate what modern electricity is worth.

Company Energy Use—Waste or Utility?

Electrical energy has been looked upon as so cheap a commodity for many years on power company premises that it is startling to find that in some cases between 3 and 7 per cent of the total kilowatt-hours generated are used in station service and that the same ratio range applies in typical instances where the total company usage is compared with the total generated and purchased electricity delivered at the buses. This does not justify a crusade against the highest grade of lighting all through a utility property or a declaration of war against the liberal use of power for auxiliaries and of electric space heating in desirable applications. But there is a useful analytical job here for the engineering department if the figures of a half-dozen well-run properties which recently came to hand are reasonably accurate results of departmental metering over the past year.

Using round figures only, in one case the generating plants of a large hydro property consumed 11,000,000 kw.-hr. in 1933, the total generated being 331,000,000. A steam plant serving a city of 200,000 people used up 3,800,000 kw.-hr., generating 61,400.000. A large urban system with two steam stations chalked up 26,400,000 kw.-hr. against station service and used from 10,000,000 to 11,000,000 kw.-hr. in its many substations and offices. The total generated energy was 850,000,000 and the generated and purchased energy for the year was 1,009,000,000 kw.-hr. Space will not permit detailing the consumptions and ratios for all the companies, but in general it appears that while the percentages of company-consumed energy are not large in themselves, the value of the energy thus used runs into very substantial totals where even the wholesale price of bulk primary power, say of the order of 1 to 2 cents per kilowatt-hour, is applied.

Even if this kilowatt-hour figure is dropped to a mere operating cost base of around 5 mills, the number of thousands of dollars per year represented by company use of energy is enough to cause an engineering-minded executive to sit up and take notice. Where generating plants absorb several million kilowatt-hours annually in internal service and substations absorb several hundred thousand, the signal is set for some worthwhile analysis which will also take in the use of energy in offices and company stores. It is time that preventable wastes be controlled.

What the States Require in Industrial Lighting

By
E. J. POOR
Chairman of the Board,
Hygrade Sylvania Corporation

Nation-wide survey shows lighting codes cover worker protection, but omit production factors. Reporting officials recommend education in industry.

NO BETTER investment exists for American industry today than that of adequate illumination. Good work is predicated on proper lighting. A full day's productive effort from workers, with minimum fatigue and maximum satisfaction, is possible only with sufficient light when and where needed. An enviable accident-prevention record is in large degree underwritten by good lighting throughout the industrial establishment. Are we not justified, therefore, in presuming that adequate illumination is a prerequisite of every industry in every state of the Union?

It was for the purpose of checking that assumption and ascertaining to what extent state departments of labor and industry interest themselves in adequate industrial lighting that our organization recently undertook a nation-wide survey of industrial illumination codes and regulations. The proper officials in each state were queried by means of a questionnaire. The fact that several follow-up letters were required to about one-third the states suggests a possible lack of interest in any impartial survey of industrial conditions. All states finally replied. A few reported no department charged with the supervision of industrial matters, but since they are mainly agricultural states their absence does not alter the general picture materially.

Too often is adequate illumination taken for granted by state labor departments. Only eleven states have codes and in these industry merely keeps within the law, not recognizing the economic value of light. Spokesmen for 37 states are in favor of adequate illumination and the predominant suggestion made is that education rather than legislation would best bring industrial standards to their proper mark.

Of prime interest to us as lamp-bulb manufacturers is the matter of codes or regulations applying to minimum lighting requirements for factories, mills and other work places. It would seem that illumination cannot be left to individual judgment or choice. A certain irreducible minimum of light is required for the welfare and safety of workers even if industrialists are insufficiently far-sighted to appreciate that good lighting is one of the soundest investments in their productive efforts. Yet in answer to our question regarding codes or regulations, it appears that only eleven states follow and enforce the code of lighting for factories, mills and other work places, approved August 18, 1930, by the American Standards Association, or its own equivalent. Six states report an inadequate code of their own. Twenty-six states, of which two are now working on lighting codes, have no code for the present. The balance failed to answer.

The A.S.A. code of lighting referred to is generally considered a satisfactory standard to go by. It deals with the advantages of good illumination in its opening section. Indeed, it actually does a splendid "selling job" to those industrialists who may still hesitate to recognize the need for adequate light beyond complying with governmental regulations, if any. It deals with the measurement of illumination for industrial interiors. The avoidance of glare is particularly stressed. Wiring requirements as applied to adequate illumination are dealt with. All in all, it is a good general code to follow, either to the letter or as the foundation upon which to build special codes applying more particularly to basic industries of any given state.

Maintenance factors recognized

Massachusetts, New York, Oklahoma, Oregon, Pennsylvania and Wisconsin have their own lighting codes. An examination of these codes indicates their avowed purpose of setting minimum and specific illumination requirements not only for mere safety but also for minimum eyestrain and proper working efficiency. The Massachusetts lighting code, for example (Industrial Bulletin No. 18, dated March, 1923), covers the general requirements—definitions of terms used, use of standardized photometer for light measurements, etc.; intensities required, expressed in foot-candles at floor level and at the work, for various parts of a plant; the protection from glare; the distribution of light; entrance and exit lighting, and general notes and recommendations. It is interesting to note that the Massachusetts

authorities are well aware of the detrimental effect of dust and dirt on luminaries and bulbs, for the code states that "to reach at all times the mandatory values required in Rule II, the initial illumination, when the equipment is installed, should exceed those values by at least 25 per cent." Thus a factor of safety is insisted upon. Other state officials point out in their answers that while new installations usually provide ample illumination, the light levels drop off in actual use because of lack of maintenance in many instances.

Many states discharge their lighting supervision and regulation simply by including a small section in their general labor or building code. Such regulations are simply blanket requirements, leaving to the inspectors an enormous latitude in what may or may not pass.

While so many states have no code or regulation applying to industrial illumination, officials express keen appreciation of the imperative need for adequate lighting where people are at work. A total of 37 have expressed themselves in favor of adequate illumination, the balance failing to answer. An analysis of their answers with regard to industrial illumination conditions in their respective states discloses the following general situation:

Opinion Expressed	No. of States
Lighting conditions considered fair	11
Few places considered really good	1
Lighting conditions vary widely	4
Lighting conditions considered very good	5
Lighting conditions considered bad	2
No complaint with existing conditions	1
Lighting conditions considered good	5
Plenty of light, but improperly located and arranged	1
Largely a matter of plant owner's fancy	1
Only sufficient to prevent accidents	1
No answer	9
Cannot answer (no data available)	4
Answer too vague	3

In the absence of codes or regulations applying specifically to lighting requirements, most states are nevertheless interested and their inspectors insist on satisfactory lighting at least for accident prevention, and often for the welfare of the workers, using their own judgment as to what constitutes the minimum requirement. In some states the Labor Department or equivalent works under a general law which gives inspectors power to order changes in ways, work and machinery where same are found to be detrimental or dangerous to life, health or limb of employees. It is under such a section or ruling, then, even though specific requirements may not be specified, that inspectors take up the illumination of factories and other working places. Minnesota is a case in point. Its labor officials report that while there is no standard code for lighting in force in that state, the law provides the necessary jurisdiction to see that places are lighted properly.

Accident prevention governs

WHERE illumination is left to the judgment of state Labor Department inspectors, without a code as a definite guide or yardstick, it would seem to this writer that lighting conditions are considered almost entirely from the standard of accident prevention. Inspectors do insist on sufficient light to avoid accidents. Otherwise, in most instances, the illumination must be at such low levels as to impose immediate eyestrain, for the question of adequate lighting for efficient production seems not to concern most inspectors. Therefore, the industrialist should not accept the Labor Department inspector's judgment, in those states where no code is in force, as applying to *adequate illumination from the production standpoint.* This thought is best epitomized by the statement from one of the non-industrial states to the effect that existing industrial illumination in that state is "only sufficient to prevent accidents by stumbling over objects or into pits. With constant thought on the meter, little attention is usually paid to eyestrain or increase of efficiency and output!"

Education should be used

AS TO the creation of a greater appreciation of adequate illumination in work places, several suggestions are forthcoming from state Labor Department officials. The one predominant suggestion is that *education,* rather than legislation, should be employed in bringing industrial illumination levels up to the proper mark, not solely for accident prevention or to meet any existing regulation, but rather for minimum eyestrain and greater and more efficient productive effort from workers.

Another general impression gathered from the answers is the lack of understanding on the part of many industrialists, even at this late date, concerning the proper use of light by means of correct fixtures and placement. "Many people still have the idea that too much light is harmful, or at least not beneficial," states the Industrial Commission spokesman of Wisconsin. "They do not differentiate between conditions of having a large amount of light properly distributed and controlled and that of having light improperly controlled. In other words, they believe that glare is often a direct result of having too much light because the light is poorly directed." Meanwhile, the New York State Labor Department spokesman states that "most of the difficulty is in the light and fixtures, the location and range, as well as failure to clean either the lamp bulbs or the fixtures," when inadequate light still persists despite minimum requirements.

Industry does not know lighting values

The conclusion to be drawn from this survey is that American industries, taken as a whole, have not as yet come to appreciate the value of adequate lighting. Where state codes or regulations are in effect the minimum requirements are observed, but only too often as a matter of meeting the law rather than by way of a sound investment in better workmanship, better satisfied workers, greater production. Too many industrialists still keep an eye on the electric meter, whereas the real cost is in labor charges. Few industrial plants appear to enjoy really adequate illumination in terms of minimum eyestrain. The correct use of light for proper distribution and the elimination of glare are still in the pioneer state.

American industries might well look to their light bill—not as rendered by the electric power company, for that is insignificant in terms of production costs, but in the more indirect terms of better workmanship, satisfied workers, maximum production and an enviable accident-prevention record. Light is the best investment today for American industries. State regulation should not be necessary to make keen industrialists see the point from a purely selfish standpoint. But to protect working people as a whole, and also industrialists frequently against their will, satisfactory codes or regulations should be in force throughout the country.

Generator Without Turbine Serves as Condenser

With interconnected power stations it is convenient to have a very flexible arrangement of capacity units. Here is an example of what can be done to satisfy particular system conditions most economically. Hydro units are frequently made adaptable to synchronous condenser service, but this company has done it for a steam unit. The idea might be adopted by other companies to advantage.

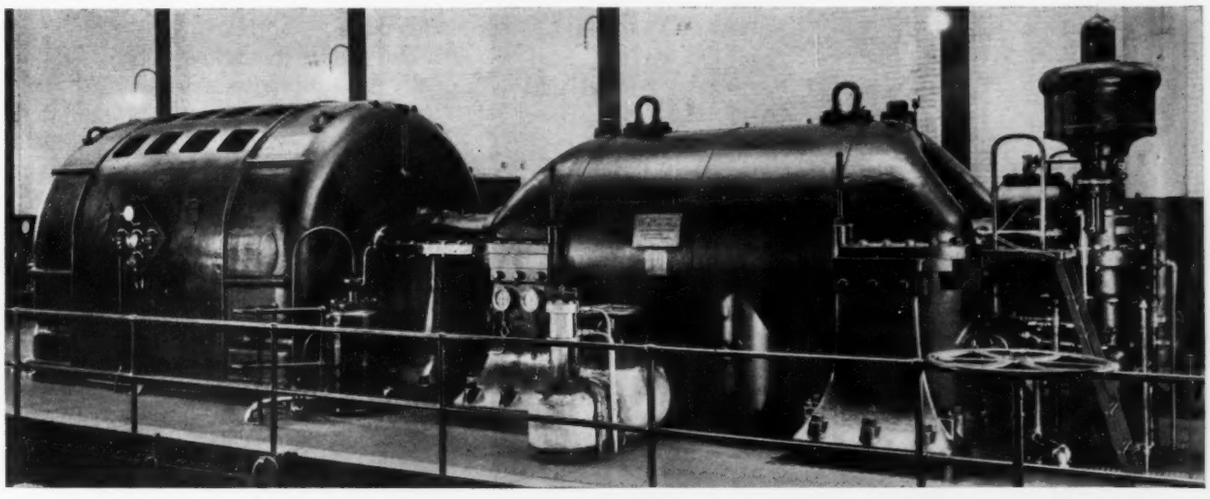
By
M. J. LOWENBERG
Stone & Webster
Engineering Corporation

THE Blackstone Valley Gas & Electric Company, in 1931, found that it would be economical to purchase its required energy from the Montaup Electric Company, in which it has a financial interest, rather than to generate it at its own power station. In order to do this it was necessary at its Pawtucket station to provide some means for maintaining voltage regulation, to provide additional transformer capacity between the 66-kv. Montaup system and the 13,800-volt bus and to provide means for maintaining a grounded neutral on the 13,800-volt system.

At the Pawtucket station there is a 12,850-kva., 2,300-volt, three-phase, 60-cycle generator, connected to the 13,800-volt bus through a delta transformer bank. Investigation indicated that this generator is of the salient-pole, parallel-slot type without retaining rings on the rotor end windings, consequently it could be started as an induction motor with the field winding short circuited. The turbine would therefore not be required for starting the unit. Use of this generator as a condenser would result in a considerable saving in investment costs and if run with its turbine uncoupled would result in low-cost operation. It was found that an inexpensive thrust bearing could be installed to prevent the coupling faces from touching.

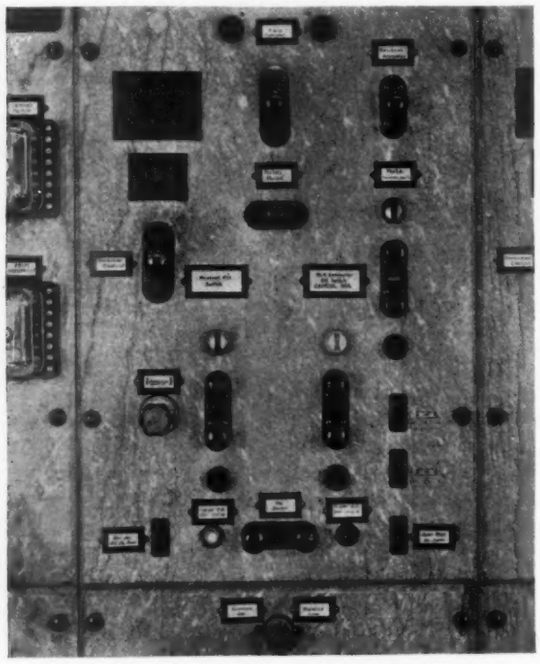
It was decided, therefore, to install equipment necessary to operate this generator as a condenser rather than purchase a new synchronous condenser. As a part of this installation it was decided to include a grounding transformer with taps suitable for starting the condenser.

The load at Pawtucket consists primarily of power for mills and the power factor imposed on the station by this load varies from 70 to 78 per cent lagging. The



12,850-kva., 2,300-volt, three-phase turbo-generator unit, the generator of which was disconnected from the turbine and operated as a synchronous condenser

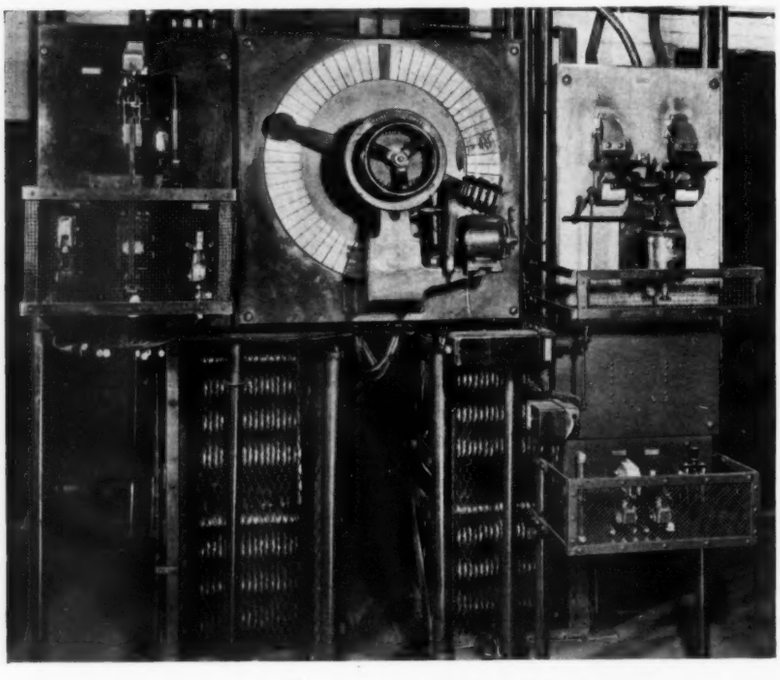
25,000-kva. transformer bank connecting the Pawtucket station to the Montaup system has a rating at 70 per cent power factor of only 17,500 kw. Operation of the generator as an 11,000-kva. condenser makes it possible to carry a load of approximately 23,400 kw. on this transformer bank without exceeding its rating. This increase in capacity, which amounts to 34 per cent, will postpone the installation of additional transformers.



Close-up of control panel showing new condenser control equipment tied in with existing generator control equipment

Field control equipment

Field short-circuiting breaker with control relays is shown at left, field rheostat in the center and field breaker at the right with its control panel below it.



The grounding transformer and its switching are properly chargeable to the grounding system, since it was considered that this equipment was needed whether or not the condenser was installed. Practically no additional expense was incurred in making the grounding transformer suitable for starting the condenser. However, even including the cost of the grounding equipment, the total cost to make this generator operate as a synchronous condenser was considerably less than a new synchronous condenser of corresponding capacity. It was appreciated that the losses on the generator and transformer bank connected to it would be greater than the losses in a modern synchronous condenser. This increased loss, however, cannot be charged entirely to the operation of the generator, as at most times of the year this loss helps to provide heating required in the plant.

Details of Operation

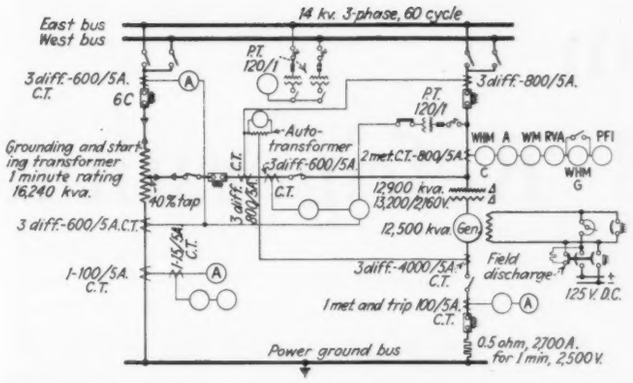
Operation of the generator as a synchronous condenser is simple and is accomplished in the following manner:

The coupling between the turbine and generator is disconnected and the generator thrust bearing installed. With the crew available this takes about 5½ hours and is done only at infrequent intervals. The exciter and the oil pump for the generator bearings are started and the transfer switch is turned from generator operation to synchronous condenser operation. The start button is then closed, which automatically connects the generator to the low-voltage starting taps of the grounding transformer. When the condenser has attained a steady slip speed a timing relay opens the field short-circuiting switch and closes the field switch applying excitation. After the condenser begins to supply leading kilovolt-amperes a timing relay opens the starting breaker and closes the main breaker. The operator then cuts in the voltage regulator, which is the same one as used for operating as a generator.

Unless the oil pump is in operation the condenser will not start. In addition to the interlocks through auxiliary switches on the starting switch of the oil pump a pressure relay on the discharge line of the pump prevents starting of the condenser unless there is sufficient oil pressure on the bearings. Should any of the steps in the sequence fail to function the condenser will shut down.

The condenser can be shut down automatically by pushing a stop button. In practice, however, the transfer switch is turned to generator or non-automatic control and the operator opens the machine oil circuit breaker, but leaves the field breaker closed until the machine comes to rest. Operation of the stop push button would automatically open the field breaker, which would mean a considerably longer time for the machine to come to rest.

The total time required to put the condenser on the line is approximately three minutes, of which time one minute is used for making certain that the machine is being properly lubricated. The time interval between the pushing of the start button and the closing of the main oil circuit breaker is approximately 107 seconds. It takes



Schematic diagram showing automatic control circuits for synchronous condenser

approximately eight minutes for the machine to come to rest when the field is left on. In starting, the field rheostat of the condenser is set at a position which gives the least voltage disturbance to the system. This position was found by trial to be at a point giving a field current about half way between the full-load and no-load values. In starting the generator as a condenser a highly lagging load of approximately 9,000 kva., which decreases to about 3,000 kva. in one minute, is added to the system. There is a voltage dip of approximately 7 volts and an overswing on transferring to full-line voltage of about 3 volts. These voltage fluctuations have not proved objectionable as the unit is started at a time when they are least noticeable.

Two years of satisfactory use

The unit has been operating nearly two years now as a synchronous condenser and the performance has been highly satisfactory. Load and voltage variations due to starting and putting the condenser on the line are as follows:

	Kva.	Volts
Initial bus voltage	....	116.5
Closing of starting switch initial	9,000 lag	110.0
Changing to	3,000 lag	116.0
Closing of field switch initial	9,000 lag	116.0
Changing to	3,000 lead	119.5
Transfer to main bus initial	9,000 lead	113.0
Changing to	5,000 lead	119.5

The type relays and settings are as follows:

Function	Designation on Diagram, W.E.&M.Co. No.	Type	Settings
Accelerating period	18	SC	4 amp. instantaneous
Timing relay—accelerating	18Y	JD	44 seconds
Transfer	19	CW	30 tap No. 10 time
Timing relay for transfer	19Y	JD	7 seconds
Undervoltage protection	27	CV	1 minute 98 volts
Sequence protection	48	MC13	2.2 minutes
Oil supply protection	TH	MC13	1 minute

The sequence diagram shown gives in more detail the interlocking and protective features.

The engineering work involved was done by Stone & Webster Engineering Corporation in co-operation with the engineers of the Blackstone Valley Gas & Electric Company and the Westinghouse Electric & Manufacturing Company.

Sectional Electric Drive Saves in Paper Making

Discussing the economic considerations which govern the selection of paper mill drives before the American Pulp and Paper Mill Superintendents' Association at Poland Springs, Me., R. R. Baker of Westinghouse said $500 more spent for sectional electric drive over the outlay for a single motor drive would save an additional $6,800 annually. As a typical example of estimation he chose a 136-in. nine-section Fourdrinier machine designed to produce 50 tons of book paper per 24 hours over a speed range of 150-600 r.p.m. with a production schedule requiring an average yearly operating speed of 50 per cent of the maximum speed and a power requirement of 200 hp. at maximum paper speed. Assume a difference of $50 in the price of the finished product and the cost of the raw material, also that the equipment will be installed in a plant operating a modern power plant with a power demand in excess of that which can be met on the non-condensing unit and with a marginal steam cost of 20 cents per 1,000 lb. and a marginal power cost of ½ cent per horsepower hour and with a 6,000-hour operating year. In each case let there be included with the first cost the cost of all material, as well as installation costs including labor and material. With both the single-motor and variable-speed turbine cost include also installation costs for variable-speed lineshafting, pulleys, belts, clutches, gear stands, etc. For such a drive the estimate would be as follows:

	Sectional Electric Drive	Single Motor Mechanical Drive	Variable Turbine Mechanical Drive
First cost of complete drive installed	$44 775	$44,275	$37,000
Improved functional efficiency:			
1 per cent for sectional and one-tenth of 1 per cent for single motor	6,000	600	.....
Improved mechanical efficiency:			
Elimination of lineshafting	600	.....	.....
Improved thermal efficiency:			
Main power house unit compared with variable-speed turbine units	850	850	.....
Reduced maintenance:			
Elimination of lineshafting, bearings, clutches, belts, etc	1,000	200	.....
Total savings	8,450	1,650	.....

This estimate would indicate that with sectional electric drive as compared with variable-speed turbine mechanical drive a yearly saving of $8,450 could be obtained with an additional investment of $7,775, or when compared with single-motor mechanical drive a yearly saving of $6,800 could be obtained with an additional investment of $500. When a comparison is made between single-motor and variable-speed turbine mechanical drive the estimate indicates that a yearly saving of $1,650 could be obtained with an added investment of $7,275.

As indicated, the foregoing estimate is on the basis of the installation of a complete new paper machine drive, including not only the driving equipment but, in the case of the single-motor or variable-speed turbine, also lineshafting, gear stands, clutches, belts and pulleys. In those cases where the machine is already equipped with satisfactory mechanical parts suitable for the proposed operating conditions the first cost of the complete drive installed would be somewhat less than the figures given for either the single motor or variable-speed turbine.

Hot Water From Reversed Refrigeration

By B. J. HOMKES

Refrigeration Engineer
Westinghouse Electric & Manufacturing Company, East Springfield, Mass.

WATER HEATERS of greater than 100 per cent efficiency can be built on the reversed refrigeration. Such efficiencies are calculated by dividing the heat input to the water by the heat equivalent of the electrical power input to the condensing unit. The output of the condensing unit, i.e., the input to the water, is the sum of the heat input to the condensing unit plus the refrigeration load.*

In reversed refrigeration water heating, the refrigerating unit is in reality nothing more than a heat pump, since it transfers heat from one temperature level to a higher level just as a water pump transfers water from one level to another. However, the means of producing this transfer of heat is considerably more involved than the transfer of water. Since heat is not a physical substance it cannot be treated as such. Water, on the other hand, is a physical substance and can be moved by a physical means. There are three basic fundamentals upon which refrigeration is based:

1. That heat flows from a warmer to a colder object.
2. That a considerable amount of heat is necessary to vaporize a liquid.
3. That the temperature at which a liquid boils depends on the pressure to which it is subjected.

Water heated by condensation of refrigerant

If the pressure on a liquid refrigerant is reduced to produce a boiling temperature below the temperature of the surrounding medium heat will flow into the refrigerant, causing it to boil or vaporize. The vapor or gas produced contains all the latent heat of vaporization. This gas must be removed by the condensing unit as fast as it is formed to hold the pressure constant; i.e., to hold the boiling temperature constant.

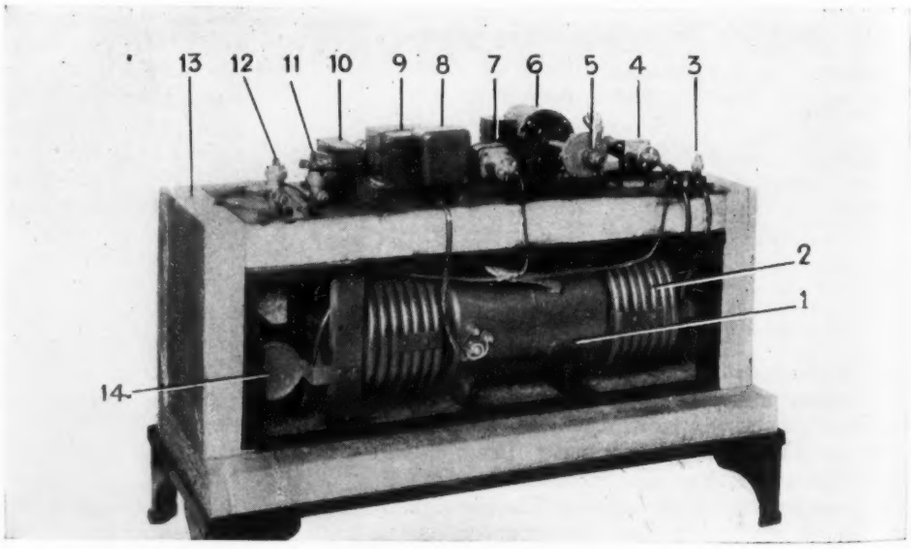
The condensing unit draws the gas from the evaporator into the compressor and compresses it. During this operation the condensing unit does work on the gas. The expended energy is transformed into heat and is absorbed by the gas. The high pressure, high temperature gas is forced into the water-cooled condenser, where the heat is extracted, causing the gas to condense and the temperature of the water to rise.

Besides the heat generated while the gas is being compressed additional heat is generated due to electrical and frictional losses. Every means should be employed to cause the maximum amount of heat to flow into the water.

Reversed cycle refrigeration has been used for house heating too, "Electrical World," December 17, 1932, page 828.

Compact refrigeration compressor is adapted to water heating by reversed refrigeration

1. ½-hp. compressor
2. Condenser
3. Outlet water tap
4. Water regulating valve
5. Circulating pump
6. 1/20-hp. single-phase motor
7. High-pressure cutout switch
8. Starting relay for compressor
9. Capacitor elements for compressor
10. Transformer for compressor
11. Liquid refrigerant line shut-off valve
12. Gas refrigerant line shut-off valve
13. Celotex insulation
14. Liquid receiver for refrigerant



The equipment necessary for producing hot water by the reversed refrigeration method is:

1. A condensing unit.
2. An evaporator.
3. A water storage tank.

Small unit takes care of 50-gal. tank

A condensing unit for producing hot water, which was tested in the "Home of Tomorrow" of the Westinghouse Electric & Manufacturing Company at Mansfield, Ohio, is shown herewith. A standard $\frac{1}{2}$-hp. commercial compressor was used, except that a coil of $\frac{3}{8}$-in. copper tubing was soldered around the motor shell. The condenser was made of double tubing, one $\frac{3}{8}$-in. copper tube inside of a $\frac{5}{8}$-in. copper tube, helically wound, and mounted concentrically over the motor shell and water coil.

Water is circulated through the water coil and condenser by a small circulating pump driven by a 1/20-hp., single-phase, 60-cycle motor. A centrifugal pump is used because it does not build up an appreciable head when the discharge line is closed.

One of the more unusual innovations at the "Home of Tomorrow" is the use of reversed cycle refrigeration for the hot water supply.

Two and more kilowatt-hours of heat are added to water for each kilowatt-hour of compressor consumption.

Ten gallons per hour of 148 deg. F. water for average power input of 1 kw.

A high-pressure cutout switch has been placed in the electrical circuit to stop the compressors before any damage results from excessive head pressures. It is mounted on the top plate.

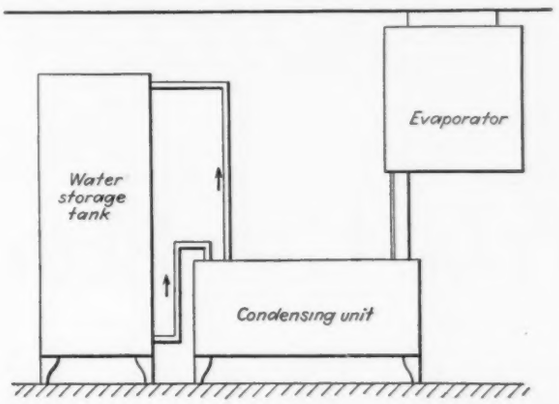
The evaporator is a standard air-conditioning unit. It consists of a finned coil over which air is blown by an electrically operated fan. The fan is made of cast aluminum, dynamically balanced, to give quiet operation, and the entire fan assembly is mounted on rubber to eliminate vibration noises.

The expansion valve is of the thermostatic type, set to operate at a back pressure of 20 lb. per square inch. This provides for the maximum refrigerating capacity of the unit in the 80 deg. F. room. If the room temperature falls below 80 deg. F. the capacity of the unit is reduced. The heater is not recommended for operation if the evaporator is placed in a room in which the temperature is less than 65 deg.

The storage tank has a capacity of 52 gal. and is insulated with balsam wool to reduce the heat leakage. A cycling control is located on the tank with its bulb wrapped tightly around the circumference of the tank approximately one-third the distance from the bottom of the tank. The control is set to operate at 140 deg.-125 deg.

When enough water has been drawn from the tank to lower the temperature of the water at the control bulb to 125 deg. F., the control closes the circuit to the heating system. The motors of the condensing unit, water pump and evaporator fan start simultaneously as soon as the circuit is closed. The water regulating valve does not open immediately, however, but keeps the water in the water coil and condenser until the head pressure is 140 lb. per square inch. In the meantime the water is heated to 150 deg. F. As the head pressure reaches 140 lb. per square inch the valve opens and allows only enough water to flow to keep the head pressure constant.

The circulating water is drawn from the bottom of the storage tank through an insulated pipe to the inlet part of the water pump. From the pump it is forced



Heat extracted from condensed refrigerant warms tank water

through the water regulating valve into the water coil soldered on the compressor motor shell. Here the water absorbs the heat generated in the motor. It then enters the inner tube of the condenser, where it absorbs the latent heat of the condensing refrigerant. Finally the water flows into the top of the storage tank through another insulated pipe.

In case the head pressure becomes abnormally high the high pressure cutout switch will open the circuit to the compressor, leaving the water pump operating. The pump will circulate the water through the condenser, thereby reducing the head pressure to normal, and the compressor will start again. The pressures at which the cutout operates are 200-150 lb. per square inch.

As additional protection to the system a thermostat has been located on the end of the motor shell to stop the compressor motors if the current or shell temperatures become excessive.

The refrigerant cycle used in reversed refrigeration water heating is normal in all respects. The high-pressure liquid leaves the liquid receiver through a screen and shut-off valve and flows to the expansion valve, which is located inside the evaporator shroud. Here the pressure is reduced to 20 lb. per square inch. The low-pressure evaporating liquid flows through the evaporator tubes, picking up heat from the air that is being blown over the fins and tubes. The heat-laden gas is drawn into the compressor and is compressed. The compressed, high-temperature gas is forced into the condenser, where it is condensed. The liquid then flows into the liquid receiver and is stored there until it is used for another cycle.

From laboratory tests in a room held constantly at 80 deg. F. the following capacities and performance were obtained:

The time required for the heater to raise the temperature of the water in the storage tank from tap water temperature to the tem-

perature at which the water temperature control operates is called the pull-up time. The heater was started at a stabilized temperature equal to the room temperature.

The initial conditions were:

1. Water temperature in tank, deg. F 46
2. Stabilized heater and evaporator temperatures, deg. F. 80

The final conditions after pull-up were:

1. Outlet water temperature, deg 154
2. Discharge pressure, lb. per square inch..... 135 to 138
3. Suction pressure, lb. per square inch..... 20
4. Power input, kw.-hr. 5.787
5. Time to pull up, hours.. ..... 5¼
6. Over-all efficiency, per cent..... 175

After the heater had pulled up it was allowed to cycle. Sufficient water was drawn at the end of each cycle to operate the control. Some adjustments were made during this test.

1. *Gallons of water drawn between cycles..... 10.3
2. Outlet water temperature by thermometer, deg. F... 151
3. Inlet water temperature by thermometer, deg. F..... 55
4. *Average cycling time (3 cycles) .....1 hour 26 minutes
5. Average input (3 cycles), kw..... 1.03

*These values will be affected by control bulb settings.

With the heater operating, all the hot water was drawn from the storage tank.

The following capacities are available for peak loads:

1. Gallons above 150 deg. F..... 30
2. Gallons above 140 deg. F..... 40

The hot water from the heater was run into a measure to check the continuous capacity. The following results were obtained:

1. Gallons per hour discharged..... 10.14
2. Inlet water temperature, deg. F..... 60
3. Outlet water temperature, deg. F..... 148
4. Efficiency running continuously, per cent..... 230

Trial-Use Plan Increases Range and Water Heater Saturation

Some Interesting Results of a Four Months Experiment in Orlando, Fla.

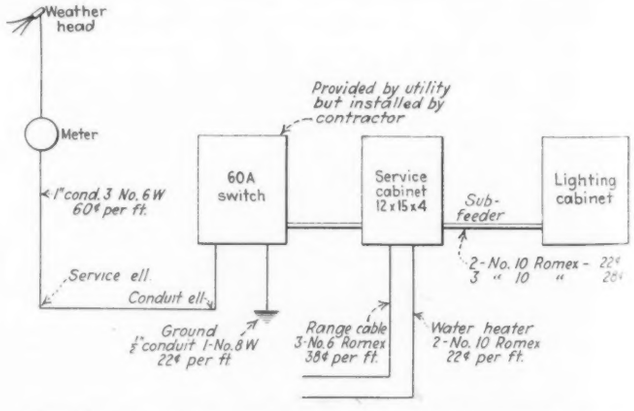
By ALLEN M. PERRY
Electrical World

BECAUSE magnitude appeals strongly to most people we are accustomed to hearing more of what the larger utilities are accomplishing than of the smaller ones. We naturally think of large companies being more aggressive and progressive. And when any one talks of municipal systems we are likely to shrug our shoulders, because under political control so many of them lack incentive and so few give a clear accounting picture. But after visiting the Orlando (Fla.) Utilities Commission, I see that there are some small cities served by municipal systems that can contribute experiences and practices no less valuable than ordinarily obtained from larger companies. For they have protected their operation against political manipulation, provided a real business organization, included all charges, even to rental of city property and janitor service, and established rates in a manner that any private corporation would accept.

One phase of the commission's activities is of particular interest. This is its attempt to build domestic business by adopting a "Trial Range Plan" which included electric water heaters.

It is rather too soon to give a glowing picture that will stimulate one with large figures. It started November 1, 1933. But even at that, on April 1, 1934, just four months after, the results should be inspiring to any small city, when one realizes that selling electric household equipment in the South is quite a different problem than in the North. Nearly every one has negro servants. As a result there isn't the personal interest in relief from heat, discomfort and drudgery that there is where the housewife does her own work, or where the local servants demand ideal operating conditions. Furthermore, many Southerners believe it is next to impossible to convert a negro cook from the customary ways of working. However, E. G. Bardwell, manager of new business, has given me evidence that it can be done.

The Orlando Utilities Commission serves about 5,800


Weather head
Meter
Provided by utility but installed by contractor
60A switch
Service cabinet 12x15x4
Lighting cabinet
Sub-feeder
1" cond. 3 No. 6 W 60¢ per ft.
Service ell
Conduit ell
2-No. 10 Romex - 22¢
3 " 10 " 28¢
Ground ¾" conduit 1-No. 8 W 22¢ per ft.
Range cable 3-No. 6 Romex 38¢ per ft.
Water heater 2-No. 10 Romex 22¢ per ft.

Specifications for connecting ranges and water heaters

See Table II for amounts allowed contractors for wiring other than those shown.

After a year's experience in selling ranges and water heaters, this municipal plant in a small city decided to see what a trial offer would do. A plan was worked out, in co-operation with dealers, that has increased saturation and revenue and awakened public interest in electric cooking. It is a bit of experience worth a little study by any power company.

G. H. EDWARDS
President Orlando Commission

L. B. FORT
General Manager of Commission

domestic electric customers, in addition to providing commercial power and municipal service. These customers consume about 32 per cent of the total output and provide about 43 per cent of the total revenue. On November 1, 1932, before any great effort had been made to stimulate the use of electric cooking and water heating, their saturation was 5.1 and 2.5 per cent respectively. Gas was selling for about $1.35 per 1,000 cu.ft., and wood, used extensively for combined heating and cooking in the winter, sold for $2.50 a strand (quarter cord). At that time dealers were selling hardly any ranges, their use was decreasing and a campaign was started to offset the decline, but was abandoned November 1, 1933, in favor of the "Trial Range and Water Heater Plan." In many respects it is like the Hartford plan, which was carefully studied before launching the local one. Assistance was also obtained from Electromaster, Inc.

Table I—Cost of Placing 316 Units on Line

New-Business Department and Range and Heater Installations up to February 28, 1934.

Expense			
Total salaries to February 28, 1934		$3,109.60	
Advertising and miscellaneous expense		3,457.08	
Commissions paid for appliances		255.00	
316 units, $21.60 each			$ 6,821.68
Investment			
Special services for range and heater loads other than trial	$4,510.00		
Special services for trial ranges and heaters	2,613.10		
		$7,123.10	
Additional investment in overhead lines and system for loads other than trial	5,484.45		
For trial loads	2,617.93		
	$8,102.38		
66⅔% due to installation		$5,400.00	
316 units, $39.60 each			$12,523.10
Investment in heaters and ranges			9,881.70

	Ranges	Saturation Per Cent	Water Heater	Saturation Per Cent	Total	Saturation Per Cent
March 1, 1934	470	8.02	239	4.08	709	12.1
November 1, 1932	263	5.1	130	2.5	393	7.7
Gain	207		109		316	

On April 1 of this year, after four months of the "trial plan," the saturation of electric ranges and water heaters had been built up to 8.02 and 4.08 per cent respectively. One hundred and three trial ranges and 63 trial water heaters are now in service. About three to five applications are received daily. As many ranges are put on trial in one month as were sold in the whole year of 1933. One-half of the increase in saturation may be attributed to the range campaign previously mentioned (November 1, 1932-November 1, 1933), and the other half to just four months of the trial plan. A report later in the year may be expected to show even better results, as summer weather is more conducive to a desire for "heatless" cooking. From the beginning of the trial plan up to April 1, 1934, the winter months, the ranges have averaged 154 kw.-hr. per month and the water heaters 220 kw.-hr.

A summary of the expenses of acquiring this load is given in the accompanying table. It should be pointed out that this summary also includes ranges and water heaters other than those placed on trial, but the utility does not actually sell the equipment. That has been left to dealers. The promotional expense has averaged $21.60 per unit and the service investment $39.60 per unit, making a total of $61.20 per unit. Attention should be called to the fact that results are being obtained in the face of increased competition brought about by the reduction in gas rates, which allows one to get gas as low as 90 cents per 1,000 cu.ft.

Low rental cost featured

The trial plan was introduced to the public with newspaper publicity and bill stickers which featured the low cost of rental—5 cents a day—for four-plate range with automatic oven control, and the economy, speed, cleanliness, coolness, safety and simplicity of electric cooking. The water heater is a 30-gal. insulated tank. While both units are put out under the name "Orlando" the range is a 5,000-watt Waldorf model made by Electromaster, Inc., and the water heater is a 1,500-watt Hoffman unit. As in the Hartford trial plan no equipment is sold by the utility, so dealers can take advantage of the promotional offer to expedite the sale of ranges.

A rental of $1.50 a month is charged for either range or water heater and $2.50 for the combination. This includes installation, wiring and free servicing. L. B. Fort, general manager of the commission, advises that this charge covers interest on the investment, retirement of the investment, servicing and commissions paid to dealers for placing trial equipment. The rate for energy is 9 cents per kilowatt-hour for the first 30 kw.-hr., 6

Table II—Basis for Paying Contractors Installing and Connecting Ranges and Water Heaters

All conduit and wiring from weather-head service entrance to the utilization devices is provided and installed by the contractor at the unit prices given below.

60-amp. distribution center installed*	$22.00
100-amp. distribution center installed*	31.50
1-ft. ½-in. Conduit and 1 No. 8 wire installed	0.22
1-ft. ¾-in. Conduit and 2 No. 10 wires installed	0.28
1-ft. ¾-in. Conduit and 3 No. 10 wires installed	0.30
1-ft. ¾-in. Conduit and 2 No. 8 wires installed	0.30
1-ft. ¾-in. Conduit and 3 No. 8 wires installed	0.35
1-ft. 1-in. Conduit and 3 No. 6 wires installed	0.60
1-ft. 1¼-in. Conduit and 3 No. 4 wires installed	0.70
1-ft. Romex with 3 No. 6 wires	0.38
1-ft. Romex with 2 No. 10 wires	0.22
1-ft. Romex with 3 No. 10 wires	0.28

*Includes installing all three of the cabinets shown in drawing, and providing service and lighting cabinet and contents; switch cabinet is provided by utility; outdoor meters in cabinets are being used extensively.

cents for the next 50 and 2 cents for all in excess, so most of the cooking and water heating is done on the lowest step. A discount of 10 per cent is allowed on bills paid within ten days of presentation.

Aside from using this trial plan to help dealers sell more ranges, the Orlando Utilities Commission pays any of the eleven co-operating dealers $5 for each trial range for which they secure application and furnishes each dealer with a range and water heater for his display room. Ninety days after a trial range is connected the name of the customer is given to the dealers as a prospect for purchase of equipment. This period is allowed so the customer will not be bothered until she has had an opportunity to test electric cooking.

Contractors are employed to install the equipment and connect it to the house service. As indicated by the accompanying schedule, contractors are paid a flat rate for supplying and installing the switch cabinets, with the exception noted, and a unit rate per foot is paid for all conduit and wiring from the service entrance to the utilization devices. The range and water heater wiring investment is capitalized by having each customer sign off property rights to the commission.

Customer deposits required

Customers are not required to rent the equipment for any definite term, but the idly curious are discouraged by requiring a $10 deposit, which is refunded after the equipment has been in service one year or replaced with purchased equipment. If the customer already has an electric range or water heater, a deposit of only $5 is asked for either trial device. If both trial range and water heater are installed the deposit is $15. If a customer using trial equipment moves to a location not wired for the equipment the commission will have the wiring done on the first move, but retains the deposit in such a case.

Servicing of the ranges is expected to average less than $2.50 per unit per year, because they were made especially for rental and can be kept in good condition without much expense. By using three No. 6 wires voltage complaints are virtually eliminated and service calls are thus reduced. No trial ranges have been turned back yet, but if any are they will be rehabilitated and re-rented. It is not expected that rehabilitation will cost more than $4 per range, says Mr. Fort.

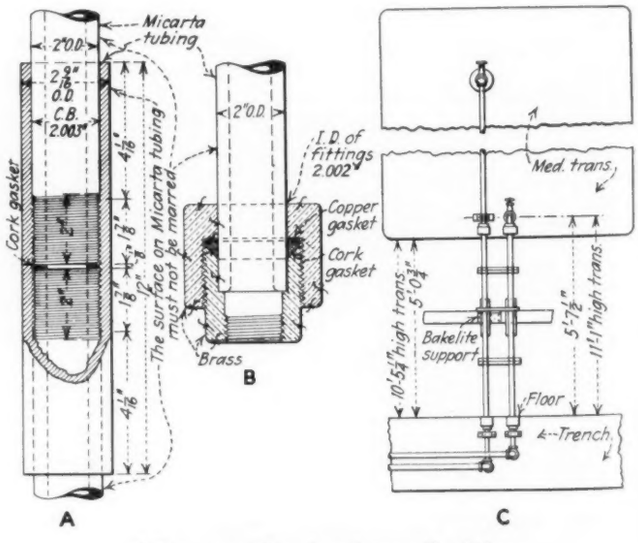
During the four months that the trial plan has been in action the dealers have not sold as many ranges as had been hoped. However, 30 units have been sold, compared with practically none before the plan was inaugurated.

Plans are now being formulated whereby the user of trial equipment can become its owner. After one year's use she has the option of applying the rental on the outright purchase price of $96. This price covers the cost of the range, interest on the investment and the commission paid to dealers and contractors for securing new users and purchasers. For securing trial customers the dealer's commission will be $5. When the contract for purchase is obtained an additional commission will be paid. The total commission is about the same as the margin a dealer would have on selling most ranges from his own stock.

Insulated Oil Line for Laboratory

By RICHARD BANZ
Chicago, Ill.

One of the problems that had to be solved when it was decided to raise the capacity of the 1,000,000-volt transformers in the high-tension laboratory of the Commonwealth Edison Company, Chicago, by externally cooling the oil was to insert adequate insulating joints in the oil piping. Micarta tubing looked practicable from the insulating standpoint, but its use, in turn, raised other problems. In the first place Micarta tubing is available in lengths no longer than 5 ft. Since the third transformer of the series is mounted on an insulating platform about 11 ft. from the floor and the intermediate one is up something over 5 ft. all four of the pipe-insulating sections had each to be made up of joined lengths of tubing. With the connections to the metal piping at the ends of each section of tubing there were required three special joints, as illustrated.



Micarta tubing insulates oil piping

Joint in 2-in. tubing was made by inside threading a 12-in. piece of 2⅜-in. tubing, then boring out each end to leave a 3¼ in. threaded section in the center. The smaller tubes were then screwed in with a flat cork gasket between them. All parts were painted with bakelite varnish before assembly and the joint so painted when completed. Connections to the metal pipe were made without threading the Micarta by means of compression gaskets of cork and copper.

Energy Costs at the Substation

Analysis of Production and Transmission Costs Shows the Influence of Business Conditions

AN EXHAUSTIVE STUDY of the cost of generating, purchasing and transmitting energy to substations in 1932 has recently been completed by the Edison Electric Illuminating Company of Boston in response to a suggestion of the Massachusetts Department of Public Utilities. The analysis takes account of electricity produced in the company's own generating plants and that purchased from other sources of supply; it allocates investment costs and operating expenses to production and transmission, and arrives at an average figure of 1.28 cents per kilowatt-hour delivered to substation cable terminals for the conditions prevailing during the year. The work was done under the direction of the statistical bureau of the company.

In presenting this allocation, the company points out that it reflects the conditions brought about by subnormal business, and for this reason does not represent the company's determination of the cost in normal times. Nor does it represent the unit cost of any particular class of service. It does, however, represent an average above and below which could be computed allocated costs for various classes of service, and these naturally depend largely upon the allocation theory chosen. In view of the depressed business conditions existing in 1932 the kilowatt-hours over which to spread capacity costs were extremely subnormal, especially in the case of large industrial customers, and the results estimated cannot in any sense be regarded as a yardstick for rate making. Nevertheless, the study is most valuable because (1) it illustrates methods of procedure applicable in principle to many other cases, and (2) because its computations are focussed on a specific operating company system during the latest available calendar year.

Procedure in cost analysis

Investments in generating plant and substations are compiled from the company's books and records. The transmission line investments are based upon an exhaustive detailed study made in 1931-32 by L. L. Elden, then technical adviser to the general superintendent. In this study the investment in overhead lines unassociated with distribution lines and the investment in underground cables represent actual costs. In the case of underground conduit occupied by both transmission and distribution cables the transmission investment is an allocation of actual costs based upon duct occupancy by each class. These compilations have not been reviewed, but were accepted as reasonable for the purpose of the study.

Fixed charges were taken as the sum of (1) taxes assessed on the company's total property and taxable income; (2) total interest paid on obligations less amounts received from loans, bank deposits, etc.; (3) dividends declared, and (4) the amount set aside for depreciation. The data are not submitted as an appropriate return on the investment, but merely as a basis for the development of the study. These charges are allocated pro rata on the basis of average investment in each kind of property, which method has the effect of charging production and transmission with a pro rata share of the cost of carrying working capital.

In the detailed study costs are allocated directly to two operations, "production" and "transmission." "Production" costs are those associated with the production of energy at company generating stations. "Transmission" costs are those associated with transmission of all kinds, regardless of its final disposition. In the final allocations, however, a further approximate allocation of the "transmission" costs is made between transmission costs associated with purchased energy and those associated with deliveries from points of production, or of receipt of purchased energy, to "distribution" substations. At these substations energy is converted for use or for distribution—for direct use in the case of high-tension customers' substations, and for distribution in the case of company distribution substations.

By means of this last allocation, approximations of allocated cost of generated energy delivered to distribution substations and of purchased energy delivered to substations are obtained.

These allocations of cost between generated and purchased energy are mutually interdependent. If the company had chosen to generate instead of to purchase interchange energy, the allocated average cost of generated energy would have been reduced and the allocated average cost of purchased energy increased (considered, of course, on the unit or kilowatt-hour basis). These relative costs, therefore, depend on controllable factors, but they are all the more interesting because the aim of all operations is to reduce to a minimum the average or unit cost of combined generation or purchase.

This elaborate study of costs by the Boston Edison Company, done for the Massachusetts Commission, works out full allocation of charges and develops principles of interest and value to other systems. The effect of abnormal times on average cost is reckoned as a guiding experience for future use.

Table I is a summary of costs allocated to energy delivered to substations and average allocated costs per kilowatt-hour delivered.

The energy handled in connection with the delivery analysis is shown in Table II. The grand total volume of energy generated and purchased was 1,077,143,225 kw.-hr., of which 996,953,834 kw.-hr. was delivered to customer and company substations. The Boston Edison high-tension plant consists essentially of two main steam generating stations located in South Boston (L Street) and North Weymouth (Edgar station); feeders transmitting energy at 6.9 kv., 13.8 kv. and 24 kv. to customer and company owned substations located in Boston and some twoscore outside municipalities in the 700-square mile area served, and 66-kv. and 110-kv. circuits interconnecting Edison with the New England Power Company on the southwest (via Millbury), west (via Clinton) and north (via Woburn and Tewksbury). At the beginning of 1932 the generating capacity of the company in all stations totaled 375,910 kw.; there were about 125 customer and company substations in service receiving energy at 6.9 kv. and upward.

A schematic diagram illustrating a limited portion of the Edison high-tension system is shown opposite. As the allocation of delivery costs is not set forth by voltage classifications or by groups of substations or single installations, it is unnecessary to present here a complete system diagram. Enough is given to indicate the relationships of the generating plants and a few substations to one another and the manner in which the interconnections between Edison and the New England Power Company fit into the picture. Throughout the Edison system the basic principle of providing for continuous service by supplying energy to substations via more than one route and by two or more feeders has been consistently applied. In the absence of certain phase-angle corrective equipment at the Woburn substation a portion of the northern area served by the Edison company is normally disconnected from the L Street generating station and operated on purchased energy during hours when New England Power energy is being received from Tewksbury (the terminus of the 220-kv. line from Fifteen-Mile Falls and of various 110-kv. New England Power circuits).

Table I—Summary of Energy Delivery Costs to Boston Edison Distribution Substations, 1932

"Stations" means generating stations (as "L" street and Edgar) and points of receipt of purchased high-tension energy for conversion to lower transmitting voltages for delivery to distribution substations (as at Woburn).

"Distribution substations" includes customers' substations where energy is sold at high tension, and company substations where energy is converted to distribution voltages. The expenses given below represent the total company costs allocated to generation, purchasing and transmission of energy, and not the bare costs of the departments immediately concerned with these activities. The cost of distributing energy from substations to customers via the lower voltage system (4,600 volts, etc.) is not included in this allocation.

			Cents
1. Generating costs			
Operating expenses	$3,224,682		
Fixed charges	4,696,458	$7,921,140	
Cost at stations per gross kw.-hr. generated			1.07
Cost at distribution substations per kw.-hr. delivered			1.18
2. Purchasing costs (electricity)			
Operating expenses	$41,400		
Energy costs	2,274,845		
Fixed charges	281,169	$2,597,414	
Cost at stations per kw.-hr. purchased			0.77
Cost at distributing substations per kw.-hr. delivered			0.80
3. Transmission-to-substation costs			
Operating expenses	$281,875		
Fixed charges	1,930,855	$2,212,730	
Cost at distributing substations per kw.-hr. delivered			0.22
Total costs		$12,731,284	
Average cost of generated and purchased energy at stations per gross kw.-hr. generated and purchased			0.98
Cost of generated and transmitted energy to distribution substations per kw.-hr. delivered			1.40
Cost of purchased energy and transmitting to distribution substation per kw.-hr. delivered			1.02
Average cost of generating, purchasing and transmitting all energy to distribution substations per kw.-hr. delivered			1.28

Major features of allocation

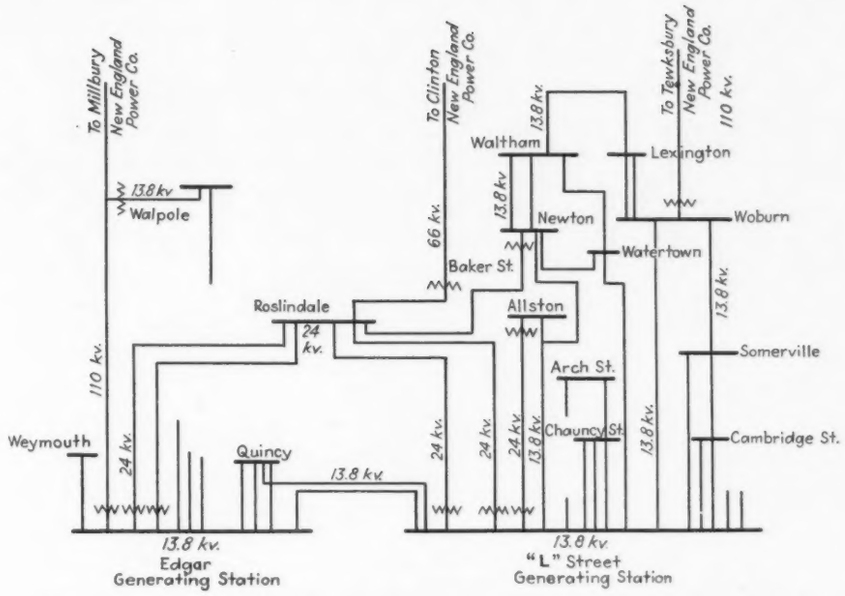
TOTAL operating expenses of the company in 1932 were $12,448,034, and of these the analysis allocated $5,499,527 to production (including purchased energy) and $323,275 to transmission. The purchased energy cost was $2,274,845, leaving the operating expenses allocated to generation at $3,224,682. Referring to Table I, summarizing the results of the entire allocation, the following material bearing upon the derivation of the data there presented is of interest:

Space will not permit publishing the entire detail by which the allocation of $5,499,527 as the proportion of company expenses chargeable to generating and energy purchasing costs was reached, but certain points of value may be set forth. Whenever possible direct costs readily ascertainable were charged to production or to transmission without modification. Those items requiring estimates were either based on available records or prorated between the two operations in accordance with the best judgment of the company. Where necessary, values were arbitrarily assigned within limits believed from experience and knowledge of the system to be reasonable.

The operations of the generating department in the Boston company in 1932 included the production, purchase and transmission of energy as well as the handling of substations owned by the company. Interchange transactions are also performed by this department. Broadly speaking, until electrical energy procured from whatever source reaches the customer who buys it at relatively high voltage (as 6.9 kv. and upward), or is delivered to the distribution system (either alternating or direct current), it is in the custody of the generating department. Responsibility of that department does not end at the outgoing line or transmission feeder leaving the generating station en route to a substation, but rather after energy has been delivered to the distribution circuits, whether these emanate from a generating plant or a substation. Put in still another way, the generating department procures energy in bulk and delivers it at the proper points and voltage for distribution. Maintenance of lines is handled by the distribution department.

A summary of the operating expenses chargeable to production (including energy purchase) and transmission is shown in Table III.

To save space many operating expense items associated with the general administration of the company apart from those belonging to the generating and distribution departments have been omitted from this table.



Basic scheme of generating plant, substations and transmission facilities

Limited portion of the Boston Edison system with principal interconnections

but notes on their origination and determination are given for such as appear to be useful in more than a local fashion.

Production Division—System operators are allocated to transmission because of their duties. Superintendence is allocated between transmission and production in the ratio of system operators' cost to the production items of operating labor, supplies and expenses, and maintenance, or 4.2 per cent to transmission and 95.8 per cent to production.

Substation Division—Allocations of operating labor, supplies and expenses and maintenance are based upon generating department records of the cost of operating transmission substations. Superintendence is allocated in the ratio of operating labor, supplies and expenses, and maintenance (allocated transmission expenses) to total expenses in these items, i.e., 4.9 per cent to transmission. Care of supplies was allocated in the ratio of transmission items supplies and expenses and maintenance to the total of these items, i.e., 3.4 per cent to transmission. The laboratory item, covering principally the care of meters, relays, etc., was allocated on the basis of relative substation labor, or 5.4 per cent to transmission.

Distribution Department—Transmission allocations are based on an analysis made by that department.

Installations Department—The only expense here associated with production and transmission is lamp renewals. These are estimated as $5,850 and $375, respectively.

Electrical Engineering Department—Allocation is based on departmental estimates that 10 per cent of its work applies to transmission and practically none to production of energy.

Other Operating Expenses—Except for the work of placing insurance and compiling production operating statistics, practically all the work of the executive and statistical bureaus is caused by distribution. Only $5,000 was therefore allotted to production. In the auditing bureau accounting expense is the only outlay associated with production and transmission, and this work consists of keeping operating costs and plant investment records. It is estimated that a force with a payroll of $15,000 per year can carry on this work, allocated 93 per cent to production and 7 per cent to transmission. The allocations of educational and employment bureau 1932 expenses were based on payrolls. In the purchasing department the allocation is based upon the distribution of supply department expenses, which are determined by the cost of materials furnished the various operations. Production takes 4.7 per cent of purchasing department expense and transmission 2.6 per cent.

The company's general service department allocation includes a variety of clerical office work, undistributed telephone expense, care and maintenance of buildings and their equipment. The allocation was based on office employee activity and building requirements. Of the total office payroll of about $2,525,000, production was charged with 4.25 per cent and transmission with 1.5 per cent. Preliminary studies at office, shop, storeroom and building requirements indicated that about 3.5 per cent of the investment should be allocated to production and 1.75 per cent to transmission.

The basis of allocating general structure investments to production and transmission is outlined below:

Allocation of general structure investments

1. *General Offices*—Analysis of the payroll allocated to production and transmission employees requiring office space resulted in a total of $105,426 for production and $35,616 for transmission. Based on the company's average pay per employee of $1,863 per year and average space requirements of 80 sq.ft. per employee, the total general office space requirements for production employees was 4,528 sq.ft., and for transmission employees, 1,528 sq.ft.

The weighted average investment in land, office space and equipment is computed at $27 per sq.ft. for production office employees and $25.50 per sq.ft. for transmission office employees. On these bases, the allocated investment in general office property is computed at $122,000 for production and $39,000 for transmission.

2. *General Stores and Service Property and Equipment*—The company's total investment in land (allocated), general buildings and equipment was $2,189,200 on June 30, 1932. The allo-

Table II—Estimate of Uses and Losses in Delivery of Energy Generated and Purchased

Boston Edison Company (1932)

	Generated Kw.-Hr.	Purchased Kw.-Hr.	Total Kw.-Hr.
Gross output	737,743,890	339,399,335	1,077,143,225
Station uses	28,319,083	.....	28,319,083
	709,424,807	339,399,335	1,048,824,142
Unaccounted for	5,574,462	1,085,000	6,659,462
Delivered to lines	703,850,345	338,314,335	1,042,164,680
Transmission losses	30,534,205	14,676,641	45,210,846
Delivered to customer and company subs	673,316,140	323,637,694	996,953,834

cation was 4.7 per cent to production and 2.6 per cent to transmission.

3. *Garages, Automobiles and Equipment*—The total investment of $1,188,700 was allocated in the percentages of 1.1 for production and 2.66 for transmission, on the basis of automobile usage.

4. *Laboratory*—The total investment of $308,200 was apportioned to production 26.1 per cent and to transmission 3.14 per cent, on the basis of departmental charges made for laboratory service.

5. *Dining Hall, Recreation Building and Library* at the Massachusetts Avenue, Boston, general service buildings represented a total investment, with allocated land, of $333,100. Production took 5 per cent and transmission 4, based on employee use.

The general structures investment allocation sums up as shown in the following:

	Company Total	Production	Transmission
1. General offices	$4,653,238	$122,000	$39,000
2. Stores and service	2,189,173	103,000	57,000
3. Garages and autos	1,188,697	13,100	31,600
4. Laboratory	308,241	80,500	9,700
5. Recreation buildings	333,117	16,700	13,300
Total	$8,672,466	$335,300	$150,600

Other general expenses

UNDER legal expenses, no logical basis of allocation existed, and production was assigned $4,000 per year, allotting $1,000 per year additional to transmission. In regard to insurance: Fire, boiler, turbine, etc., insurance on generating and substation property is determined from the company's insurance department records and is so allocated. Workmen's compensation insurance premiums are based on the payrolls, the office and fixed payrolls carrying different rates. General liability insurance premiums are based on the total company payroll. Because of the very minor public liability incident to production and to office employees, the payroll is not a logical basis for allocating this expense. This insurance covers injuries to persons legally on company property and sidewalks, injuries caused by underground and overhead line failures, by open manholes, conduit lines, etc. The risk is primarily a distribution hazard. For this reason no expenses were allocated to production, and the allocation to transmission was made primarily on the basis of distribution department activity. The use of relative investment in property outside generating stations was found to bring practically the same result. The portion allocated to transmission is 15 per cent of the total.

Automobile insurance is allocated to production and transmission on the basis of charges made by the transportation division for the use of cars. Of the total property damages of $46,897 in 1932, $41,186 represents the cost of defending a smoke suit. An annual write-off of $8,237 was set up for this, on a five-year basis of extinguishment.

In allocating $164,476 for miscellaneous general expenses, these were divided into four groups: (1) Those having to do with financing, allocation on an investment basis; (2) expenses having a relation to employee activity and allocated on the basis of payrolls; (3) expenses incident to rate administration, promotion and commercial activities, none of which were allocated to production and transmission, and (4) specific items allocatable directly from the nature of the work done. Under miscellaneous general expenses the allocation was $18,228 to production and $18,410 to transmission. General administration salaries and expenses, $113,893, were allocated on the basis of employee activities represented by payrolls involved in the various operations. Of these, production took $11,730 and transmission $3,727.

Allocation of fixed charges

TOTAL 1932 fixed charges of the company were $18,023,721, composed of taxes, $4,942,373; interest, $4,048,898; dividends, $6,632,450, and depreciation, $2,400,000. The ratio of these fixed charges to the company's total investment was 10.67 per cent.

The total investment of the company in all plant averaged $168,901,440 in 1932. The production investment was:

Atlantic Avenue plant*	$3,070,350		
Less substation	700,000	Avg.	$2,370,350
L Street station (210,000 kw.)	$19,077,967		
Less substation	300,000	Avg.	$18,777,967
Edgar station (157,860 kw.)	$22,913,530	Avg.	$22,913,530
General property allocated			335,373
Total production property			$44,397,220
Fixed charges at 10.67 per cent			4,737,183
Rent revenues credited			40,725
Net fixed charges on generating plant			$4,696,458
Ratio of production to total investment, per cent			26.29

*Not operated in 1932.

The transmission investment exclusive of equipment in generating stations was $20,731,248 (12.27 per cent of the total investment). This was made up of overhead

Table III—Items of Operating Expense Allocated to Production and Transmission

Boston Edison Company (1932)

Generating Department	Allocated Costs (Cents Omitted) Production	Transmission	Total Company Costs
(a) Production Division			
Superintendence	$52,713	$2,310	$55,023
System operators	.....	50,401	50,401
Operating labor	502,215	.....	502,215
Fuel	1,824,460	.....	1,824,460
Supplies and expenses	99,280	.....	99,280
Care of supplies	11,894	.....	11,894
Laboratory expenses	18,884	.....	18,884
Maintenance	549,779	.....	549,779
Total division	$3,059,225	$52,711	$3,111,936
(b) Energy purchased	2,274,845	.....	2,274,845
(c) Substation Division			
Superintendence	.....	,320	47,278
Operating labor	.....	26,577	489,315
Supplies and expenses	.....	5,445	65,325
Maintenance	.....	.....	95,165
Care of supplies	.....	340	7,061
Laboratory expenses	.....	1,065	19,699
Total division	.....	$35,747	$723,843
Distribution Department			
Superintendence	.....	$4,741	$33,181
Labor	.....	80,061	488,268
Care of supplies	.....	6,477	45,293
Laboratory	.....	2,800	20,902
Materials and expenses	.....	64,891	485,028
Total department	.....	$158,970	$1,072,672
Installations department	$5,850	$375	$1,381,765
Electrical engineering department	.....	14,669	146,688
Other operating expenses, including executive, auditing, employment, statistical, and purchasing bureaus, legal insurance, general service department, sales department, general administration, etc	159,607	60,803	3,736,285
Total operating expenses	$5,499,527	$323,275	$12,448,034

lines and right-of-way, $2,531,529; conduit and cable, $14,488,262; transmission and substation investment (ten installations), $3,561,457, and general property allocated, $150,000.

The total transmission investment allocated to purchased energy was $2,635,139, made up as follows: Woburn Ring substation, $1,218,032; a 110-kv. connection with New England Power (toward Tewksbury), $244,595; one-half the Edgar Ring substation, $443,642; one-half the Edgar-Millbury 110-kv. line (Edgar station to the Medway-Milford boundary), $709,870, and general property allocated, $19,000. Deducting this total from the transmission investment leaves $18,096,109 as the investment in transmission facilities associated with transmission to substations. Fixed charges at 10.67 per cent on the $2,635,139 transmission investment allocated to purchased energy come to $281,169, and the fixed charges at 10.67 per cent on the $18,096,109 investment in facilities above noted total $1,930,855.

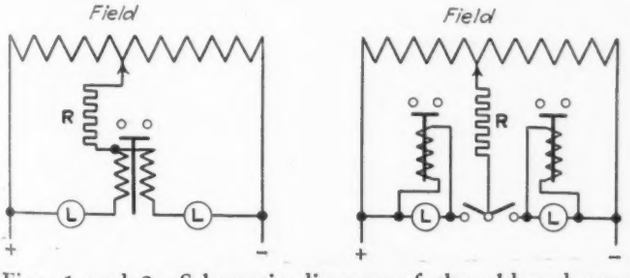
The remaining figures in Table I to be derived are the operating expenses in connection with the purchase of electricity and with the transmission of energy to substations. The total operating expenses allocated to transmission (Table III) are $323,275. The ratio of investment allocated to purchased energy to the total transmission investment is 12.8 per cent, and applying this ratio to the total operating expenses gives $41,400 as the allocated operating expenses relating to purchased energy. The remaining 87.2 per cent, or $281,875, represents operating expenses in transmission to substations.

New Ground Detector Improves Field Protection

By A. A. KRONEBERG and R. B. POLLOCK
Southern California Edison Company, Ltd.

A new type of ground detector has been developed by the Southern California Edison Company, Ltd., to indicate grounds in the field windings of synchronous machines. Thirteen of these devices are now in service on the system. Most of these installations are on large machines where field grounds could cause considerable damage and a more expensive type of detector is justified.

Detectors previously used for this service consisted of two lamps with their common connections grounded through the coils of an alarm relay as shown in Fig. 1. The relay coil is double wound so that the fluxes in the core due to the normal lamp currents add up to zero. Thus if a lamp burns out an alarm will be given. Otherwise its action is the same as a single coil relay. In the simplified diagram, Fig. 1, the grounds are not shown, but the electrical equivalent of a ground fault is indicated by the resistance R and the arrow, its location in the field winding. In Fig. 3 the percentage of circuit voltage available for the detection of ground faults in such a circuit is shown by the lines A. It will be noted that no voltage is available for the operation of the relay when the ground fault is in the center of the field winding. Since some voltage is required to pick up the relay and to overcome the resistance of the ground fault the actual "dead spot" may be an appreciable amount of the field winding.



Figs. 1 and 2—Schematic diagram of the old and new type field ground detectors

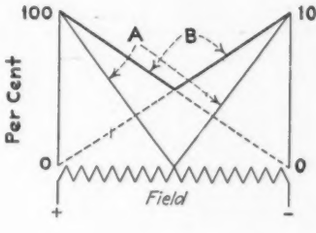


Fig. 3—Per cent voltage available for detection of grounds plotted

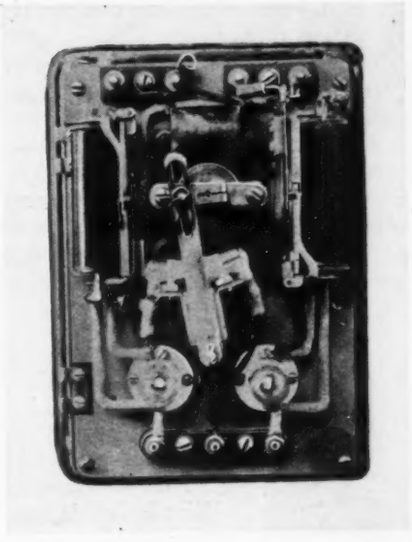


Fig. 4—The new type field ground detector with cover removed

A similar schematic wiring diagram of the new type detector is shown in Fig. 2. By comparison with Fig. 1 it will be noted that the principal difference lies in the use of a double-throw switch in the ground connection which alternately connects each lamp with its relay to ground. The relays are in parallel with the lamps so that a burned-out lamp will not prevent an alarm. The per cent voltage available for operating the relays is shown by the lines B, Fig. 3. It will be seen that there is always at least one-half of the circuit voltage available to overcome the fault resistance and to pick up the relay. Also, there is no "dead spot" and the sensitivity has been increased for all ground faults within the field winding. This is the chief advantage of the new detector and is considered sufficient justification for the added complication and cost of a continuously operating throw-over switch.

One of the new type detectors with the cover removed is shown in Fig. 4 and the internal wiring and connections to the exciter circuit are shown in Fig. 5. Referring to Fig. 5, A is a small synchronous motor with a 1-r.p.m. shaft speed. B is a single-pole, double-throw

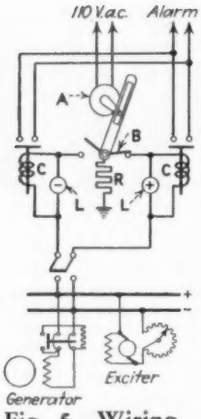


Fig. 5—Wiring diagram of the new type field ground detector

mercury switch driven by a crank connected to the motor shaft so that the throw-over operation requires only a few seconds. This allows each side of the circuit, consisting of a telephone type relay *C*, in parallel with a 140-volt switchboard lamp *L*, to be connected to ground for nearly one-half minute. The lamps are marked + and — to indicate the polarity of the ground, which is the reason for using two lamps instead of one. If means were provided for indicating the position of the mercury switch only one lamp and one relay would be necessary. The resistor *R* is used only when the detector is applied to circuits of voltages higher than 125.

The new detector has not yet been used as a relay to take the machine out of service because the present applications are at attended stations and the first ground fault does no harm. However, it may be applied as a relay to automatic unattended units. While primarily intended for the main field, it also operates on ground faults in the exciter and all parts of the excitation system. In many cases it may be necessary to use only one detector on an exciter bus which supplies a number of units.

Solder Dross Avoided by Electrically Heated Pot

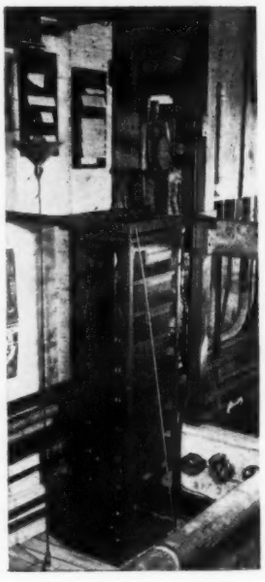
Small as it is, this electrically heated solder pot is vitally important

The Anaconda Wire & Cable Company in Muskegon, Mich., needed a number of small solder pots in the coil department for soldering connecting leads on coils. The gas-heated pots formerly used were considered a fire hazard, as well as a source of annoying fumes and dirt. In addition the relatively unregulated gas heat was believed to cause deterioration of the solder and to form an excessive amount of dross.

In an effort to improve the foregoing conditions, a new solder pot was made up in the machine shop by turning it out on a lathe from a solid piece of steel. A small cartridge-type electric heater was inserted in a hole drilled in the side of the pot. Several sizes of these heaters were tried until it was determined that 120 watts would hold the solder at exactly the right temperature. A number of these electrically heated solder pots have been made up and are operating very satisfactorily at the present time.

· · · INDUSTRY

Power-Factor Improvement Funds Capacitor in Eleven Months

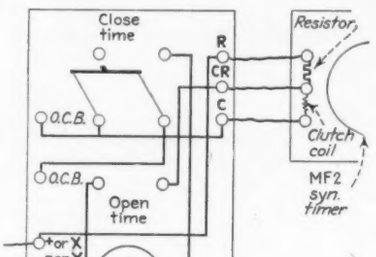


By the installation of an 80-kva. GE rack-type capacitor in this out-of-the-way place the United Steel & Wire Company, Battle Creek, Mich., saved enough in power bills to pay for the $931 installation cost in eleven months. Power bill data furnished by the Consumers Power Company indicated a monthly demand ranging from 116 to 140 kva. The yearly net bill before the installation would have totaled $8,766, while the actual year's bill after the installation amounted to $7,693, a saving of $1,073, or an average of about $89.50 a month.

Compact Timing Device Facilitates Breaker Timing

By G. H. WINTERSTEEN
Cleveland Office, General Electric Company

Use of a simple and compact testing panel with an MF2 synchronous timer forms a convenient means for testing the opening and closing of oil circuit breakers. Either opening or closing time tests are arranged for by flipping the switch from one position to the other without any change of wires. The testing panel measures 4½x6½ in. and weighs only 2 lb., making it easily portable. The synchronous timer, used for indicating the time required for the opening or closing of an electric contact, will indicate any time interval from 1/100 second to a considerable number of seconds and is available for use on 25, 50 or 60-cycle circuits. Standard windings are for 110 volts, but special windings for 220 volts are also available.



Simple circuit of the testing panel with connection to timer

PRACTICES IN BRIEF · · ·

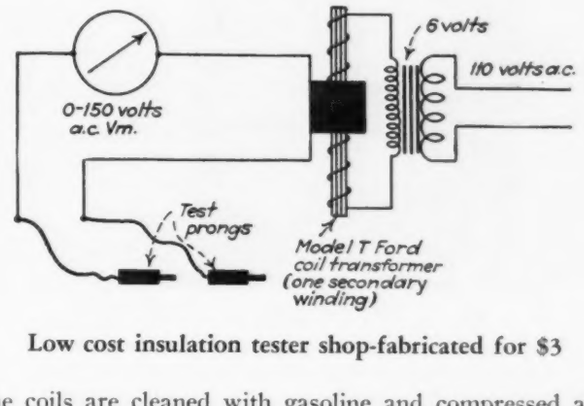
Handy Insulation Tester for the Repair Shop

By W. D. H. SHIPWAY
Long Beach, Calif.

For motor insulation resistance measurements and other repair shop measurements where quick rather than accurate results are essential a shop-fabricated tester has been used satisfactorily for more than two years. It was fabricated with a minimum of new parts at an estimated cost of $3. A 110-6-volt transformer is employed with its 6-volt winding applied to the primary winding of a transformer obtained from a model T Ford coil. Only one of the secondary windings of the coil is used and the resultant voltage is therefore approximately 10,000.

As the diagram shows, a 0-150-volt a.c. voltmeter is used for the resistance indications. A calibration for the set was obtained with a borrowed ohmmeter test set, by comparison of the voltmeter readings with various resistance values. For the particular instrument used a 2-volt indication signifies 75 megohms and 60 volts signifies 0.5 megohm.

Construction of the set requires only a couple of hours. If the operator should accidentally touch the test prongs he would experience only a tickle, with no harm. Ordinarily the set is employed to indicate the condition of motor windings. If insulation resistance is low the coils are cleaned with gasoline and compressed air, heated in an oven, dipped in clear varnish and baked from twelve to eighteen hours. Quite often the set is also employed for radio tests.

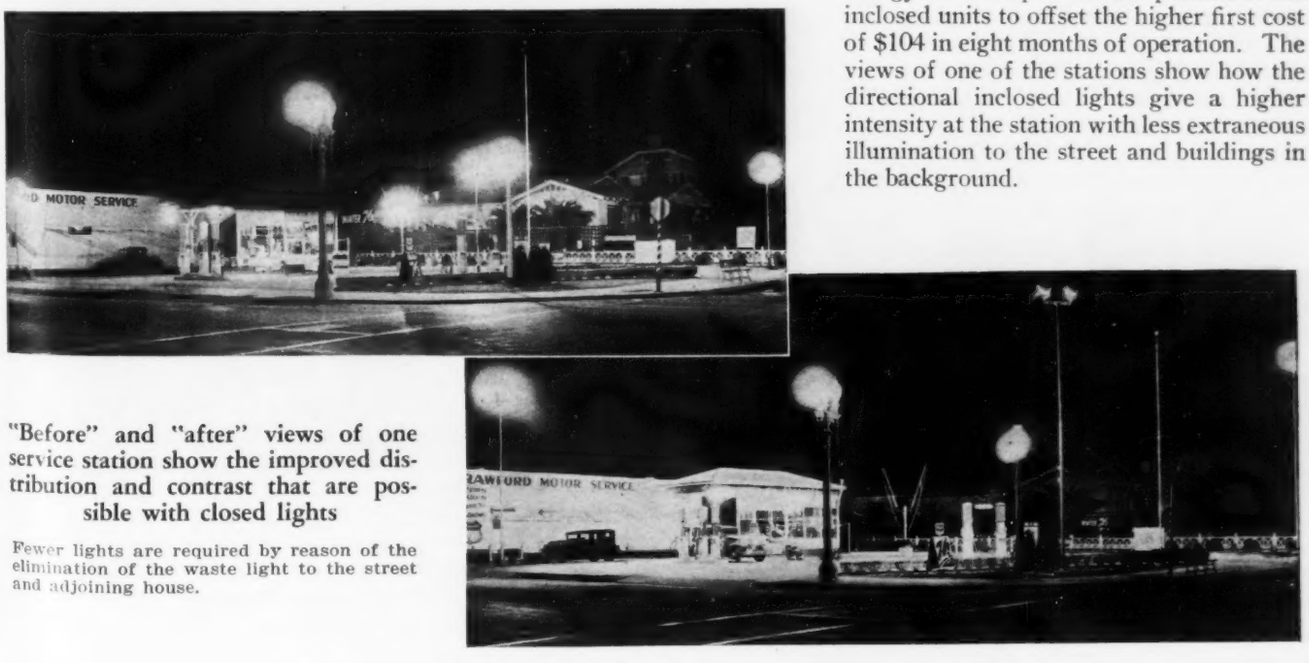


Low cost insulation tester shop-fabricated for $3

Floodlight Study Finds Closed Units Economical

Following a series of competitive tests the Union Oil Company, California, has standardized on the use of General Electric copper-bronze inclosed floodlights for use at its service stations. Even though the inclosed units cost considerably more per unit than do open-type ones and four times as much as those previously installed their increased operating efficiency, by reason of their directional characteristics, and their over-all economy, justified their adoption.

It was demonstrated that five inclosed units do the work of seven open units, both with 1,000-watt lamps. On the basis of seven hours per day operation the savings for energy and lamp renewals permitted the inclosed units to offset the higher first cost of $104 in eight months of operation. The views of one of the stations show how the directional inclosed lights give a higher intensity at the station with less extraneous illumination to the street and buildings in the background.



"Before" and "after" views of one service station show the improved distribution and contrast that are possible with closed lights

Fewer lights are required by reason of the elimination of the waste light to the street and adjoining house.

Dual-Output Generator Solves a Shovel Problem

By D. STOETZEL
Industrial Engineering Department
General Electric Company

In the limited space and congested equipment encountered in the cab of a power shovel the size of the motor-generator set has long been a problem. A dual-purpose generator has now been developed that saves space for the manufacturer and maintenance for the owner and should offer possibilities for other applications.

SINCE the first application of individual motor electric drive to shovels the designing engineers have had to contend with the problem of getting the electrical equipment in the extremely limited space available. With a.c. and d.c. rheostatic type of equipment this centers around the rather large and cumbersome resistors required for starting and speed control. With variable voltage (Ward Leonard) and modified variable voltage types, the space required for mounting the motor-generator set becomes one of the most important considerations. This is particularly so on machines of small and medium sizes.

On shovels of this class the over-all width, not including running board and similar superstructure at the side, must be kept to approximately 10 ft. in order to permit unit shipment. In practically all cases the motor-generator set is located with its shaft at right angles to the fore and aft center line of the shovel and in the extreme rear of the cab. Furthermore, on these machines it is highly desirable to make shipment in as nearly completely assembled condition as possible in order to eliminate expensive mounting and assembly work in the field by factory representatives. On shovels of larger size, where unit shipment cannot be made in any event, it is still necessary to keep the width of the structure as small as possible to insure minimum swinging space requirements. In other words, the space in which the shovel turns is frequently limited and a machine with a com-

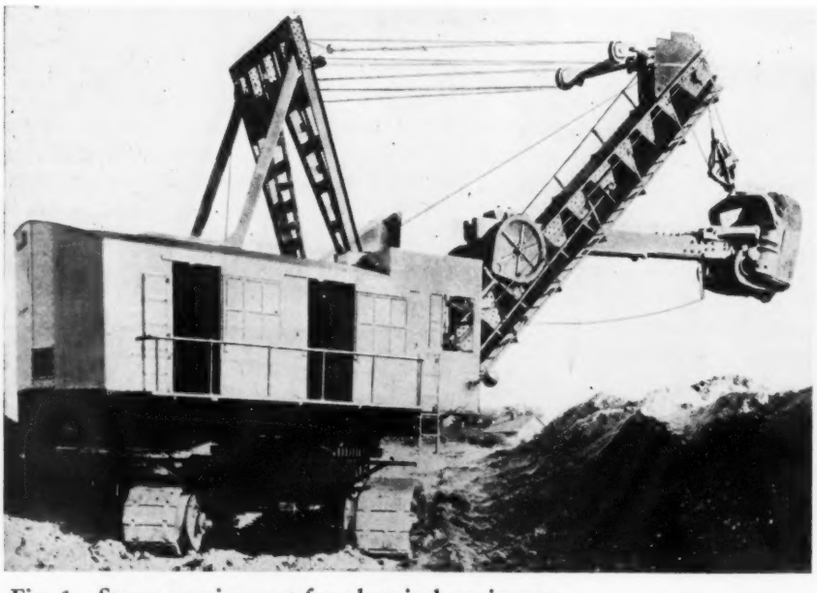


Fig. 1—Space requirement for electrical equipment in shovels is important

Marion Shovel (type 4,120) operating in South America for Anglo-Chilean Nitrate Company.

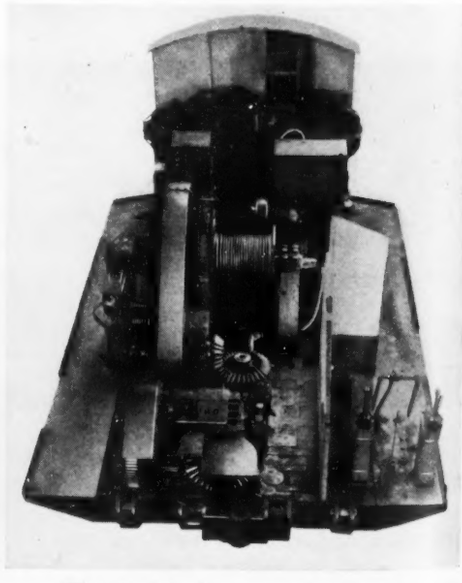


Fig. 2—Dual-output generator meets space limitations

Swing-crowd generator in Marion 2½-yd. shovel, three-bearing set, 90 kw. Induction motor 150 hp., d.c. hoist generator 65 kw., 250 volts, d.c. crowd-swing generator 25 kw., 250 volts.

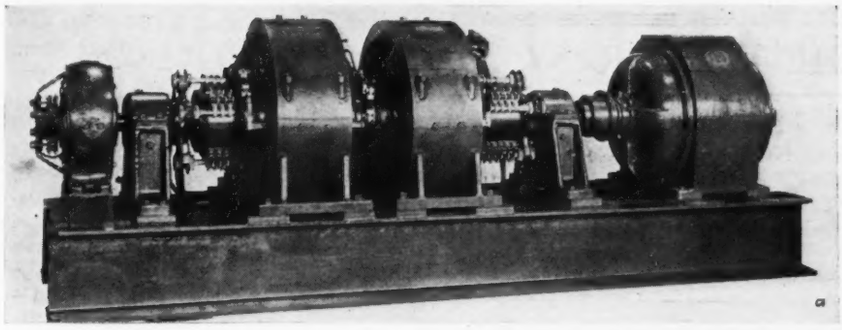
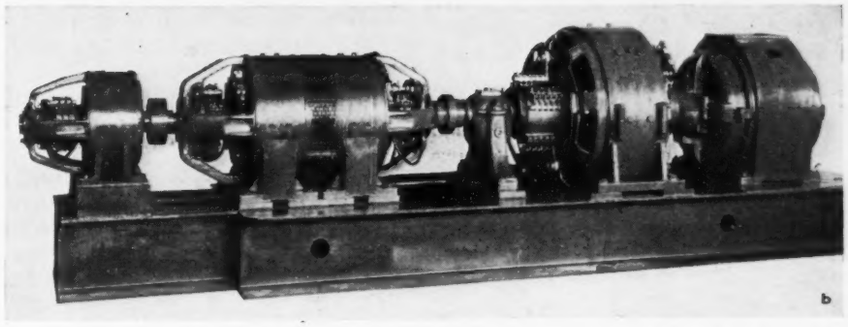


Fig. 3 — Dual output set shorter than five-unit design for 3-yd. shovel

(a) 200-hp. induction motor drives 110-kw. hoist generator and 30/30-kw. swing-crowd generator with 12-kw. exciter. (b) Ratings same as in (a), but longer shaft length necessitated is evident.



paratively short and narrow rear deck has definite operating advantages in such places. Obviously the length of the motor-generator set has an important bearing on these features.

Motor-generator sets consisting of a number of d.c. generators and an a.c. driving motor or an engine, all in line, would exceed the allowable over-all length in practically all cases if standard design and construction were used. Many special forms of construction have been employed to cut down the length of the set along the shaft, but some of these have been handicapped by high cost and others by inaccessibility for adjustment or maintenance. External appearance of the type of excavating machine on which this problem arises is shown in Fig. 1.

One generator serves two purposes

A recent development in the design of shovel sets which is of considerable importance where over-all length must be reduced is the dual output type of generator, in which a single machine having one field frame, armature and commutator performs all the functions and gives all the necessary operating characteristics of two independent machines. In the set shown in Fig. 2 the use of the dual output generator makes possible a saving of approximately 18 in. in over-all length.

The dual output generator provides two independently controlled variable voltage (Ward Leonard) circuits, one for the swing motion and one for the crowd motion. The drooping voltage characteristics, long used as standard for shovel service, are retained. Standard armature construction (except for omission of equalizers) is used with standard four-pole frame construction and four sets of brushes. Each of the power circuits is taken from a pair of brush studs and controlled by means of the excitation on a pair of diametrically opposite poles.

In a machine of this kind it would be possible to use adjacent poles in pairs, but the use of diametrically opposite poles eliminates unbalance due to unequalized magnetic pulls when the two parts of the machine are working at different excitations. The question of magnetic balance is particularly important on sets subjected to the shocks and vibrations incident to shovel service. A further advantage of the pairing of opposite poles is the elimination of the non-magnetic frame sections that would be advisable with the adjacent pole scheme.

Each of the two circuits of the dual output machine is controllable separately and independently of the other. Electrical connections are no more complicated than on two independent machines of corresponding design. There is just one limitation which must be observed in connection with dual output generator circuits—the two circuits may not be connected in series to give a single high-voltage output, may not be connected to give three-wire output and may not be connected in parallel to give a single output of higher capacity. In short, the two circuits must be separate and independent at all times.

The principle involved in the design of a two-circuit machine is not new, as it has been used successfully for some time in the standard General Electric WD welding equipment. On these sets the main circuit, having variable voltage characteristics, is taken from the same armature as the independent or separate excitation circuit, having constant voltage characteristics. In the design of a dual output generator it is not essential that the two circuits be of equal rating or entirely similar characteristics, but it is conducive to the most effective use of material and it is also productive of efficiency in design and operation if this is the case. On sets for medium size shovels the swing and crowd motors and generators are usually duplicates as regards electrical rating and characteristics.

A number of shovels using sets with dual output generators have been in operation for some time. Their performance has been entirely satisfactory. This construction is not limited to shovel service, but may be worked out for any application where many generators of similar ratings are used.

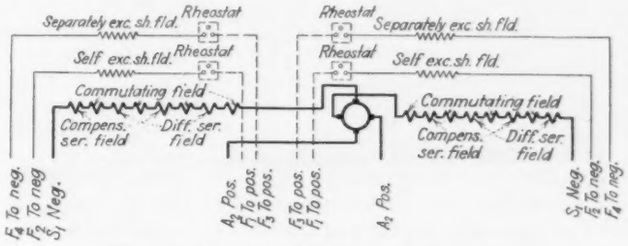


Fig. 4—Dual control circuit is simple

One for the crowd function and the other for the swing. The compensating series field windings arranged to supplement the commutating and differential series field windings on the basis of the proportions of the dual load in order to secure properly balanced operation under all conditions.

LETTERS TO THE EDITOR

Takes Issue on Appliance Cements

To the Editor of the ELECTRICAL WORLD:

As manufacturers of heating units for household electrical appliances, we were naturally interested in the article "Appliance Safety in Adequately Cured Cement," by Melton, Brownell and Easter in the ELECTRICAL WORLD for June 16.

In the fourth paragraph of the article the authors state: "Generally speaking, provided the proper electrical resistance under all conditions is secured, the use of embedding cements gives the most satisfactory results. They provide better protection of the element (from oxidation by the air, etc.) than any other means and are relatively inexpensive."

It has been the experience of the company by which I am employed (Edison General Electric Appliance Company, Inc.) that the use of cement materials for electrical insulation for heating appliances is limited to relatively low temperatures. This is because cement materials become fairly good conductors of electricity when heated to temperatures required for many applications. The inclosed type of unit ("Calrod") produced by my company does not require the use of "cement" insulation; it allows the use of the most refractory types of material. Fused magnesium oxide, for example, is a standard material used without the admixture of any impurities to cement particles together.

Unfortunately, the paper gives only relative data on insulation resistance, so it is impossible to make any comparisons with magnesia.

As to protection of the resistor from the air, Calrod units are metal-sheathed and sealed at the terminals. The statement by Messrs. Melton, Brownell and Easter that " . . . embedding cements . . . provide better protection of the element than any other means" is not correct.

O. G. VOGEL,
Engineering Department.
Edison General Electric Appliance Company.
Chicago, Ill.

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Fair Play in Indiana

To the Editor of the ELECTRICAL WORLD:

I have read the article written by W. A. Layman of Chicago in the ELECTRICAL WORLD for June 30, 1934, entitled "Fair Play in Indiana."

The information given in this article is very valuable. However, I am convinced that the writer is misinformed regarding the taxes assessed against municipally owned plants. The article states that such plants are assessed for state, county and township taxes. They are only assessed for state and county taxes, and not for township taxes.

C. G. YOUNG,
District Manager.
Northern Indiana Power Company,
Attica, Ind.

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Plant May Have Been Bought to Eliminate a Competitor

To the Editor of the ELECTRICAL WORLD:

In the ELECTRICAL WORLD of June 16, 1934, there appears an article entitled "This Utility Bought a Private Plant—to Operate It," written by Charles Benham, Jr., engineer industrial department, Rochester Gas & Electric Corporation, Rochester, New York.

It is sometimes almost impossible to look into the future and realize what certain plans will lead to, or the many factors involved, any more than Mr. Benham is now able to see that his company has obtained a plant that may be of no future benefit to the company, but may always remain a distant plant subjected to the destiny of the few industrial plants surrounding it, and that the only reason his company is operating it—instead of discarding it and coming in with its own load—is because it is a distant plant. Of course, I am no prophet who would forecast the future of this plant, but merely put this forward as a supposition. I do, however, think Mr. Benham should be more conservative in his estimates, or less hasty in approving those that emanate from the executive department.

The part of Mr. Benham's treatise that I read and reread was this: "It is a source of sincere gratification that this purchase has always shown a nice profit to both parties in spite of a severe drop in business, and this profit is not one merely of clever bookkeeping." I have seen magicians pull rabbits out of hats and I am familiar with most of the card tricks and how they are done, but this is better than any of them. I would suggest that Mr. Benham go over his figures again—remembering carefully that within a few years all the equipment which his company acquired will have to be replaced with new and up-to-date units. Then figure as closely as possible what all this renewal will cost and he may come to see that there is a glaring discrepancy in his figures.

The point which I think Mr. Benham should have stressed is this. The moment Stecher Traung Lithograph Company started furnishing power for one or two other concerns in the immediate vicinity it ceased to be a private plant. In other words, Stecher Traung was starting to compete with the power company, and the logical thing for the power company to do was to eliminate a threatening competitor even though it did not make any money on the transaction immediately, but merely figured that time and expansion would finally bring a return on the investment. The very fact that—as I have said before—it purchased a plant where most of the equipment may be nearly obsolete will go to prove that if there are any immediate profits most of those profits will have to be written off when the point is reached where the entire plant will have to be modernized.

If all private plants in the country were absorbed by the power companies it would mean no small hardship on the electrical manufacturers. And right here I want to reiterate that I have never seen a power company buy a private plant, and continue operating that plant, if the cost of getting its own load in was not prohibitive. Of course, when the private plant begins to furnish power for other concerns the aspect changes; i.e., it can no longer be designated as a private plant.

WAYNE G. BRONSON.
Oakland, Cal.

BOOK REVIEW

50 Jahre Berliner Elektrizitätswerke

(Fifty Years of the Berlin Electric Company)

By C. Matschoss, E. Schulz and A. T. Gross. Published by VDI-Verlag, Berlin, NW 7. 247 pages, 151 illustrations

With the incorporation of the "City Electric Works" on May 8, 1884, the foundation was laid for the project of which the present publication commemorates the 50th anniversary. To the reader who is interested in the historical aspect of public utility development the review unfolds a fascinating story, based on painstaking research and attractively presented. Not the least striking feature is the close parallel it reveals in the details of such growth in various communities the world over, although some situations arose in Berlin that were not duplicated elsewhere. In particular this is true of the ownership, which was private from 1884-1915, municipal from 1915-1931, and since that year has been under joint participation. The account of the well-nigh endless negotiations of the early years for licenses, manufacturing rights and franchises, successfully concluded, ought to be reassuring to present leadership in the industry.

NEWS OF THE WEEK

Knoxville Contract Approved by T.V.A.

Authority calls for bond deposits—E.H.F.A. announces new financing policy—Crosley refrigerator sanctioned.

Contract covering purchase of the Tennessee Public Service Company electric properties in Knoxville and east Tennessee has been approved by the Tennessee Valley Authority, according to an announcement made by David E. Lilienthal, T.V.A. official. The contract, drawn in a series of conferences at Asheville, N. C., has been signed by officers of the power company. It does not include the Knoxville Street Railway System.

Holders of Tennessee Public Service first and refunding mortgage 5 per cent bonds due in 1970 have been asked by the authority and the informal committee acting for the bondholders to deposit them with the Guaranty Trust Company of New York, acting as agent for the T.V.A. Actual transfer of the properties is contingent upon this action. Holders are to receive 96½ and accrued interest and holders of Knoxville Traction Company first mortgage 5 per cent bonds are to receive 100 and interest in the event of consummation of the plan. At least 90 per cent of each issue is required to be deposited on or before August 21 or such later date as may be agreed upon between the T.V.A. and the company. Each party to the contract also has the right to cancel its obligations if litigation or other contingency arises which in the judgment of either party will unduly delay completion of the purchase.

E.H.F.A. extends equipment financing

Approval was announced this week by the Electric Home and Farm Authority of a new type electric refrigerator produced by the Crosley Radio Corporation, to be for sale in Tennessee Valley area for a price of $72.50 delivered to the customer's home. At the same time announcement was made by Mr. Lilienthal, president of E.H.F.A., that the low-cost models of refrigerators approved by E.H.F.A. financing would be marketed throughout the country at the same price prevailing in the Tennessee Valley. This represents a new policy of the directors. The T.V.A. insignia of Electric Home and Farm Authority, indicating E.H.F.A. approval for financing, however, will be carried only on appliances sold in areas where there is an agreement between E.H.F.A. and the electric utility serving the area providing for low rates.

The Electric Home and Farm Authority will approve for financing in its territory any refrigerator that meets the quality specifications of the authority, sells at a retail price less than $80 and is produced by a manufacturer who meets NRA requirements and has been manufacturing for more than one year. G. D. Munger, E.H.F.A. commercial manager, announced that several manufacturers are now in production on the new E.H.F.A. models and that they would soon be available in the Tennessee Valley.

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Middle West Leads in Rural Electrification

Increased use of electricity in rural districts is rapidly giving to farm life the ease and comforts of the city dwellers' existence, delegates to the eleventh annual convention of the National Committee on the Relation of Electricity to Agriculture were told last week in Chicago. Some of the modern equipment now in use or being tested includes lights for insect control, an electric fence of one charged wire which replaces three or four strands of barbed wire, apparatus for cooling farm produce before it is shipped to market and an electrical milk pasteurizer.

An annual report of the progress made in the electrification of farms, presented by Dr. E. A. White, director of the organization, showed that Illinois, Michigan, Iowa, Indiana and Wisconsin are now among the ten states having the largest number of electrified farms. Illinois has 25,216 electrified farms, which represent 11.8 per cent of all the farms in the state; Michigan has 40,386, or 23.8 per cent; Iowa, 31,704, or 14.7 per cent; Indiana, 23,237, or 12.8 per cent, and Wisconsin, 38,490, or 21.2 per cent.

"Electric service is making rural homes as modern as any other homes," said Dr. White. "It gives the farm more efficient labor-saving facilities for running water, cooking, heating, lighting, refrigerating and makes possible the use of all the household appliances common to city homes. For stationary power operations electricity has given to agriculture the same advantages of convenience and efficiency that it has brought to industry.

"It is no longer a question of whether rural America will have electric service, but how rapidly."

Lehman Seeks Authority to Extend Utility Probe

In a special message to the New York Legislature this week Governor Lehman opened the way for legislation to establish the right of the joint legislative committee now engaged in an investigation of the power and public utility corporations in the state to sit after adjournment of the Legislature and after January 1, when a new Legislature will have been elected.

After the Governor's message had been read in the Senate Senator Dunnigan, as chairman of the committee, introduced a bill the enactment of which had been urged by former Supreme Court Justice John E. Mack, chief counsel for the Dunnigan committee. The Senate passed the bill by a vote of 36 to 1. The one negative vote was that of Senator John J. McNaboe.

In his message the Governor embodied a letter he had received from Mr. Dunnigan calling attention to the fact that the joint resolution creating the joint legislative committee to investigate public utilities contained no express provision giving the commitee the right to sit during the adjournment of the Legislature and after the expiration of the calendar year, and that doubt as to the legality of the committee so functioning might be raised unless it were specifically authorized to do so.

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Insull Requests Court for Separate Trial

Expressing his readiness to reveal all facts and details pertaining to his extensive business operations, Samuel Insull petitioned the federal court this week to sever the mail fraud case against him from those of the other defendants indicted with him in February, 1933.

Chief among the reasons cited by Mr. Insull in the request for a separate trial were his physical inability to stand the strain of a long-drawn-out trial and the fear that his identification with the sixteen other defendants will complicate and prejudice his position.

The petition stated that only eight of the defendants, including his son, Samuel Insull, Jr., have been closely allied with the elder Insull in business. The others named are Edward J. Doyle, Philip J. McEnroe, John H. O'Keefe, Fred H. Scheel, Robert W. Waite, Frank R. Evers and George A. Kemp.

Secret Rate Deal Charged to Pennsylvania Commission

Undismayed by a $50,000 slander suit brought against him by Frederick P. Gruenberg, Public Service Commissioner, S. Davis Wilson, city controller of Philadelphia, accused the entire commission of secretly and illegally approving the new Philadelphia Electric Company rates before they were made public. He also asserted that Governor Pinchot had knowledge of the alleged "understanding" between the utility heads and the commission. A reply was issued immediately by Louis Tevell, executive secretary of the commission in Harrisburg, in which he admitted the commissioners had conferred with company officials regarding the rates and had ordered the new schedule to be filed, but held that this action was perfectly legal and proper. He denied that formal approval of the rates has ever been given by the commission.

As a result of the charges Mr. Wilson brought against Commissioner Gruenberg, he was barred from appearing at the rate hearings by a resolution of the commission which characterized his conduct as "unwarranted, offensive, contemptuous and insolent." Commissioner Gruenberg then filed suit for $50,000. Before posting $2,500 cash bail to insure his appearance in the slander suit the controller made the new assault upon the commission, naming two members in particular, Commissioner Gruenberg and the late Commissioner George W. Woodruff. The latest statement also named John E. Zimmermann, president of the United Gas Improvement Company, which owns Philadelphia Electric, and William H. Taylor, president of the Philadelphia Electric Company, charging that they conferred with members of the Public Service Commission about the new rates before the company filed the rates or advertised the schedule as required by law.

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Loup River Project to Proceed Unlicensed

Deciding that the Middle Loup River, Loup River and Platte River have not been improved by the United States in the interest of navigation or such improvement authorized or recommended, and that the development would not affect the navigability of the Missouri River or any of its tributaries, the Federal Power Commission has decided that no federal license is required for the Middle Loup Public Power and Irrigation District, Arcadia, Neb., to construct a hydro-electric and irrigation project on the Middle Loup River between Sargent and Loup City, Neb.

"This is the fifth case in recent months," said Vice-Chairman Basil Manly, "in which the Federal Power Commission has refused to take jurisdiction over streams which it did not regard as navigable or where the projects would not, in the opinion of the commission, affect the interests of interstate or foreign commerce.

The irrigation area involved in the Loup River project would be about 50,000 acres. The power features include a dam 20 ft. high, a reservoir of 5,400 acre-feet storage capacity and a power plant with 2,400 hp. installed capacity, about 4½ miles south of Comstock. It is proposed to build 125 miles of transmission lines to serve pumping plants and farmers within the district and 60 miles of 33,000-volt lines to supply electric energy at wholesale rates to the cities of Broken Bow, Sargent, Ansley and Mason City.

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Business Pledges Aid to Housing Program

At a conference held last week leading representatives of manufacturing, railroading and labor pledged Federal Housing Administrator James A. Moffett the fullest co-operation in making the home improvement and building program an immediate success. Among those attending the conference were: H. P. Liversidge, president, Philadelphia Electric Company; T. K. Quinn, and C. E. Wilson, vice-presidents, General Electric Company; Lewis H. Brown, president, Johns-Manville Corporation, and Daniel Tracy, president, International Brotherhood of Electrical Workers.

COMING MEETINGS

Economic Conference of Engineers—Fourth annual meeting, Stevens Institute of Technology Engineering Camp, Johnsonburg, N. J., August 11-19. Harvey N. Davis, Stevens Institute of Technology, Hoboken, N. J.

International Association of Municipal Electricians — Wardman Park Hotel, Washington, D. C., August 29- Sept. 1. W. H. Harth, City Hall, Columbia, S. C.

Producers and Distributors of Electrical Energy—Fifth International Congress, Zurich and Lausanne, Switzerland, August 29-Sept. 7. Secretary, Union des Centrales Suisses d'Electricite, 301 Seefeldstrasse, Zurich.

American Institute of Electrical Engineers—Pacific Coast Convention, Salt Lake City, Utah, September 3-7. General Convention Committee, 1016 Continental Bank Bldg., Salt Lake City, Utah.

Rocky Mountain Electrical Association—Annual convention, Estes Park, Colo., September 10-12. G. E. Lewis, Managing Director, Gas & Electric Bldg., Denver, Colo.

Association of Iron and Steel Electrical Engineers—30th convention, held in conjunction with the Iron and Steel Exposition, Cleveland, Ohio, September 18-20. J. F. Kelly, Empire Bldg., Pittsburgh, Pa.

National Electrical Exposition — Madison Square Garden, New York, N. Y., September 19-29. Ralph Neumuller, Electrical Association of New York, Grand Central Palace, New York.

Electrochemical Society — Sixty-sixth convention, Hotel Pennsylvania, New York City, September 27-29. Colin G. Fink, Columbia University, New York.

Illuminating Engineering Society — Annual convention, Baltimore, Md., October 1-4. D. W. Atwater, Secretary, 29 West 39th Street, New York.

National Electrical Manufacturers Association — Annual meeting, Chicago, October 17-20. W. J. Donald, 155 East 44th St., New York.

. . . THIS WEEK IN WASHINGTON

Federal Power Commission rate survey opens with mailing of questionnaires . . . T.V.A. to extend plan for financing electrical equipment.

AS IT was found desirable to adopt many of the changes suggested in the power and rate questionnaires of the Federal Power Commission, their distribution was delayed that they might go out in the most desirable possible form. Mailing of the questionnaires now has been begun. Practically the entire staff engaged in the power survey is now in the field. All members of the force have been instructed, whenever at all possible as an incident to their other work, to assist power companies by explaining any part of the questionnaire which may not be thoroughly understood. Thomas R. Tate, director of the power survey, will spend the remainder of the summer in the field, as will Percy H. Thomas, chief of the power requirements division, and Erich A. Mees, chief of the power resources division. Mr. Thomas and his men expect to pay particular attention to a study of possible development of the industrial load in various areas.

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First stage of the power survey, which involved the preliminary study of the various phases it will cover, has been completed. The survey now enters its second stage, in which the data will be compiled upon which the final report will be based.

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Extension of the Tennessee Valley Authority's plan for financing electrical equipment to include localities outside of the Tennessee Valley was announced this week at the authority's Washington office. The authority has received several requests from operators of municipal plants to allow the extension to their cities of the easy payment plan in effect in the Tennessee Valley. The authority, however, probably will not limit the extension of that service to publicly owned plants. If it is found feasible to expand it preference would be given localities having the lowest rates.

PAUL WOOTON,
Washington Correspondent.

Six Companies, Inc., Gets Parker Dam Contract

Low bid for the contract for construction of the Parker Dam on the Colorado River as a unit of the Metropolitan Water District of Southern California system was submitted by the Six Companies, Inc., builder of Boulder Dam. Bids were opened last week at the office of the United States Bureau of Reclamation. The Six Companies, Inc., bid, for construction of the diversion dam and diversion tunnels, totaled $4,239,834. The only other bidder on the entire job was the Southwestern Contracting Group, Inc., with a bid of $5,496,073.

With rights-of-way, appurtenant structures and power plant, Parker Dam construction cost will be approximately $13,000,000. The site is approximately 150 miles downstream from Boulder Dam and the reclamation service will build the dam with funds furnished by the Metropolitan Water District.

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Capacitor Motor Drives Improve Electric Fans

By the application of capacitor motors to electric fans in place of split-phase motors the Westinghouse Electric & Manufacturing Company has reduced vibration, increased over-all efficiency by 37 per cent and reduced the weight of the same size fan by 30 per cent. The more uniform torque of the two-phase action capacitor motor under running conditions permits the use of a smaller motor, which is the chief weight saving. Comparison of the actual gains in the use of capacitor motors is striking in the case of the 16-in. diameter fan. The watts input has been reduced 23 per cent, with an increase of motor efficiency of 10 per cent. The speed at the high speed point was also increased 5 per cent over the old shaded pole motor to increase the actual air delivery per watt from the same size fan. The relative weights of the two are 14 lb. as compared with 20 lb. The capacitor is located in the base of the fan and is included in the weight given.

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Electric Energy Pronounced Tangible by Court

Electric energy and gas, as furnished by public utilities, are tangible property and as such are subject to the retailers' 2 per cent occupational tax imposed by the State of Illinois according to a recent ruling by Judge Harry M. Fisher in circuit court. If this ruling, which came at the end of a series of hearings begun last autumn, is upheld by the Illinois Supreme Court, it will mean that the state treasury will receive between $4,000,000 and $5,000,000 annually from electric and gas companies. This ruling was made in the cases of the Commonwealth Edison Company, the Peoples Gas Light & Coke Company and the Public Service Company of Northern Illinois, but if upheld it will affect all other public utility companies which sell electricity and gas in Illinois.

The case began last year after the occupational tax law became effective. At that time the companies in question sought and were granted a temporary injunction restraining the state director of finance from collecting the tax from them (ELECTRICAL WORLD, Sept. 23, 1933, page 395).

Main hearings opened when the companies sought to make the injunction permanent. The companies contended that gas and electricity are intangible and that their supply is not the sale of a commodity, but the performance of a service, which is exempt from the tax.

In his decision Judge Fisher held that tangible property included any property which might be bought or sold, with the exception of legal rights.

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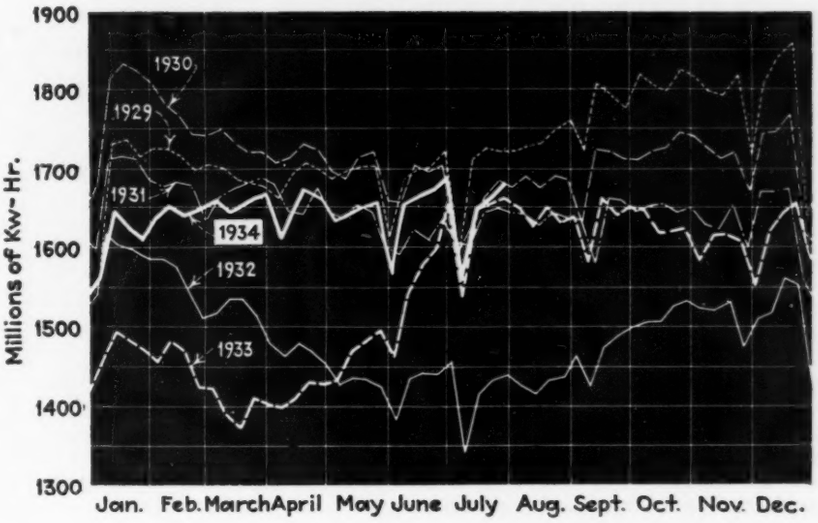
Canadian Output in June

Output of central electric stations in Canada during the month of June totaled 1,708,291,000 kw.-hr., as compared with 1,804,615,000 kw.-hr. in May. The index number, however, adjusted for the number of days in each month and other seasonal factors, was 179.43, against 182.43 for May, according to the Dominion Bureau of Statistics. Exports to the United States increased from a daily average of 3,581,000 kw.-hr. in May to 3,788,000 kw.-hr. in June.

Week's Energy Up to 1930



Energy output of central electric light and power stations again increased in the week ended July 28. Reported by the Edison Electric Institute as 1,683,542,000 kw.-hr., it surpassed that of the preceding week by 1.2 per cent and of the corresponding week last year by 1.3 per cent. The rise is the third consecutive one since the dip caused by Independence Day, and brought the output within a small fraction of the three-year peak attained during the last week in June.

The all-time maximum for the last week in July was recorded in 1929. The new figure missed this by only 2.2 per cent. It virtually matched that of 1930 and surpassed those for all other years in the history of the industry.

Gains over 1933 are shown in every geographical region listed in the accompanying table except New England and the Mountain states. In New England the deficiency compared with last year shrank to 7.1 per cent. On the Pacific coast the relatively small advance of 4.6 per cent reflects effects of the strike. Other regions with the exception of the Middle Atlantic improved over the preceding week.

Weekly Output, Millions of Kw.-Hr.

1934	1933	1932
July 28...1,684	July 29...1,662	July 30...1,440
July 21...1,664	July 22...1,654	July 23...1,434
July 14...1,648	July 15...1,648	July 16...1,416
July 7...1,556	July 8...1,539	July 9...1,342
June 30...1,688	July 1...1,656	July 2...1,457

Per Cent Change from Previous Year

Region	Week ended July 28	July 21	July 14
New England	— 7.1	— 9.0	— 9.8
Middle Atlantic	+ 1.7	+ 3.0	+ 2.7
Central Industrial	+ 0.2	— 0.1	— 1.0
West Central	+ 8.7	+ 4.8	+ 0.7
Southern States	+ 4.0	+ 1.2	— 4.2
Rocky Mountain	— 3.0	— 2.0	+ 0.2
Pacific Coast	+ 4.6	+ 5.1	+10.5
United States	+ 1.3	+ 0.6	— 0.0

As to Rates . . .

• Hartford Electric Light Company, believing that conditions have become favorable for eliminating the area charge in its domestic rates and for identifying the energy used for lighting in the higher-priced blocks from household power applications in billing such customers, has filed a revised schedule with the Connecticut Public Utilities Commission effective August 1. The company is not announcing this change as a rate reduction although many customers will receive slight reductions which in the aggregate are material in amount. A few will have their bills increased through the requirement of a dollar minimum bill, but this last feature will not be permitted to cause any increase in the annual bills of any customer for the next twelve months. For general domestic use in residences where the lighting demand does not exceed ⅛ kw. the rate will be 10 cents each for the first 10 kw.-hr. per month; 5 cents each for the next 15; 3 cents each for the next 200 and 1½ cents each for the excess. The minimum bill will be $1 per month. The present rate of 1 cent per kilowatt-hour for night water heating will be continued. Where the lighting demand exceeds ⅛ kw., the above blocks are modified by the addition of 1 kw.-hr. to the first and third blocks and 1½ kw.-hr. to the second block for each 1/30 kw. of such excess.

• Worcester Electric Light Company has been requested by certain customers in a petition filed with the Massachusetts Department of Public Utilities to reduce its lighting rates. The petition states that the rates charged by the company are unduly high and discriminatory, due, in part at least, to imprudent, incompetent and extravagant management.

• Public Service Electric & Gas Company's rate investigation took a personal turn last week when John A. Matthews, of counsel for rate reduction proponents, interrogating Thomas N. McCarter, president of the company, delved into certain real estate transactions, which resulted in property bought originally by Mr. McCarter and his brother, the late U. H. McCarter, for $200,000 being sold to Public Service for $1,700,000. Mr. McCarter explained a building had been erected on the property, assessments had been paid and the property had appreciated in value due to developments in the vicinity. "The property was appraised by Feist & Feist," Mr. McCarter explained, "and an independent committee of directors named to consider the purchase." Quizzed concerning fees paid by Public Service to United Engineers & Constructors, Mr. McCarter said he considered them proper. Mr. Matthews questioned the witness concerning his estimate that compliance with the NRA code would mean $2,000,000 additional expense to Public Service, of which $500,000 would fall upon the electric department. "I notice that in 1932, before the code, Public Service had 17,215 employees and paid them $32,338,245," Mr. Matthews pointed out. "In 1933, after four months of the code, the number of employees was only 17,431 and the payroll reduced to $27,618,714. It does not appear to me, in view of those figures, that compliance with the code is costing Public Service much." The next hearings will be held September 27 and 28, when Prof. H. C. Anderson of the University of Michigan will be cross-examined concerning his estimate of $21,000,000 for depreciation.

• South Georgia Power & Light Company has petitioned the state courts for an injunction preventing the state Public Service Commission from putting into effect an 18 per cent rate reduction. Hearing on the plea will be held August 6 before Judge Edgar E. Pomeroy. In its petition the company charges that the rates prescribed are confiscatory and that the commission is not qualified to pass on rate matters because of duress from Governor Talmadge.

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Sioux City Election Enjoined by Court

A stay order was issued by Justice Anderson of the Iowa Supreme Court restoring an injunction restraining the City Council of Sioux City from holding the special election July 30 on a proposal to issue $2,500,000 in bonds to finance a municipal electric plant costing approximately $3,500,000. This order will be binding upon the city until the court acts upon a dismissal or permanent injunction.

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Trenton, Mo., Plant Restrained by Court

United States Judge Albert L. Reeves of the Western District of Missouri, presiding in Detroit, Mich., on assignment, has issued a temporary injunction against the construction of the municipal light and power plant and distribution system at Trenton, Mo., for which that city has voted $250,000 in bonds and received a P.W.A. grant and loan of $315,000. Request for the injunction order was filed by attorneys for the Missouri Public Service Company, which serves Trenton, on the grounds that construction would amount to confiscation of the private plant.

Judge Reeves will conduct a hearing in the early fall to determine whether to make the restraining order permanent.

Moberly, Mo., Disapproves City Plant Bond Issue

Unofficial returns of the special election held in Moberly, Mo., July 24 on a $566,000 bond issue for a municipal light and power plant show that the project was defeated almost 3 to 1—2,351 against and 805 in favor of the plan. Approximately half of the registered voters participated. P.W.A. had allotted the city a grant of $134,000 and a loan of $566,000 for the undertaking. Missouri Power & Light Company, which serves the city, actively opposed the bond issue. Election was postponed from time to time and finally when the P.W.A. insisted on immediate action the election was held July 24.

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Danville Project Reopened

Undaunted by defeat last February, proponents of the huge new municipal hydro-electric power plant at the Pinnacles in Patrick County, Virginia, have succeeded in reopening the issue. The city of Danville has refiled its application with the Public Works Administration for a loan and a grant of $3,000,000.

Another election asking the people to approve the federal loan and grant can be held within 50 days after it is called. The election must be requested by the City Council and the judge of the corporation court then sets the date. A. M. Aiken, Danville city attorney, expressed the belief that two factors combined to defeat the project in the first election. These were the approaching councilmanic election and unfavorable weather conditions. After receiving official notice of the outcome of the vote Henry W. Waite, deputy P.W.A. administrator, rescinded the projects in March.

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Texas Elections Held

In two towns of Texas elections were held recently to vote on proposals to construct municipal electric light and power plants. At Gainesville a proposed bond issue of $443,000 for the purpose was defeated by a vote of 754 to 629 and at Kenedy an election to vote on issuing $161,500 of bonds for a similar municipal utility resulted in approval by a vote of 199 to 189.

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Corning, Iowa, Project to Be Resumed

Motion of the city of Corning, Iowa, to dissolve a temporary injunction brought by the Iowa-Nebraska Light & Power Company to stop construction of a municipal power plant has been sustained by Judge George A. Johnson in district court. Work on the project will be resumed at once.

FINANCIAL · · · BUSINESS

Utility Write-Ups Revealed in Probe

Federal Trade Commission charges Insull Southwest group with $20,000,000 inflation —Power Corporation of New York also accused of huge write-up—Protests made.

Charges that Insull utilities in the Southwest inflated property values, reaped huge intercompany profits and paid unearned stock dividends were made at a hearing held last week before the Federal Trade Commission. Carl H. Depue, trade commission examiner, made the assertions during an inquiry into affairs prior to 1932 of the Public Service Company of Oklahoma, its present subsidiary, the Southwestern Light & Power Company, and the Southwestern Gas & Electric Company.

Inflation in the three companies, amounting to approximately $20,000,000 on Dec. 1, 1930, resulted from inter-company profits in property acquisitions among affiliated companies, inflation of stock issues, arbitrary property valuations and failure to provide for obsolescence and depreciation charges, according to the examiner. "It is reasonable to believe that because of its inability to ascertain facts herein revealed, the Oklahoma State Commission was deceived with respect to the cost of the company's properties and consequently allowed the company to charge excessive rates for its services," Mr. Depue said.

The inflation was reflected in fixed capital and capital stock accounts of the companies, Mr. Depue asserted. In 1930, Public Service books showed a common stock valuation of $13,755,596, which, if inflation had been deducted, would have been only $3,630,009. Southwestern Light & Power showed stock value of $5,450,713, which should have been $823,378, and Southwestern Gas & Electric listed its stock value at $8,388,000, which should have been $3,144,000, Mr. Depue added.

$40,000,000 write-up in New York

At other hearings held before the Federal Trade Commission a single valuation write-up of $40,000,000 in the books of the Power Corporation of New York was revealed. According to the testimony the write-up was effected about December 31, 1928, by increasing the book value of "water-power rights and privileges" by that amount, which was credited to "surplus due to appreciation." The examiner found that this appreciation was eliminated in July, 1932, by charging "surplus due to appreciation" with $40,000,000 and crediting "water-power rights and privileges" with a like amount. No explanation for the elimination was given.

Charges protested by company

Former and present members of the Oklahoma Corporation Commission have no recollection of any rate case involving the Public Service Company of Oklahoma in which inflated values could have been listed as justification for higher rates and Fred W. Insull, president of the company, denied property valuations were inflated $20,000,000 as charged by the commission. Mr. Insull was quoted as saying property values might have been inflated $5,000,000 in 1931 because of high payments made during expansion program in 1928 and 1929, but said values in 1933 were far below their costs.

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NRA Approves Budget of Contracting Division

Announcement has been made by the National Recovery Administration of its approval of both a budget for the divisional code authority of the electrical contracting division of the construction industry and the basis of contribution to the budget by members of the industry. The budget is for a period of one year. The total amount, as originally presented to the administration, was $455,624. The administrator's approval, however, excepts from this amount the sum of $19,224 scheduled for "reimbursement of expenses of code preparation."

Dead-line for objections, criticisms or suggestions concerning the proposed budget for the electric storage and wet primary battery industry has been set for August 6. In the application by the Code Authority the total amount of the budget is placed at $42,420 for the period from July 1, 1934, to June 15, 1935. The basis of annual contributions is 1 per cent of estimated annual productive payroll plus one-tenth of 1 per cent on contracts registered of $250 or over.

CROSSROADS?

To some observers of the passing business scene it appears that once more does a crossroads approach. Decisions made by the Administration a year or so ago re-arise. Left or right? More dollar devaluation or resistance to further currency doctoring? Reform or recovery? For labor or for business? More spending to greater deficits or budget balancing and higher taxes? Election day approaches, recovery lags, the opposition marshals its forces.

The drought-wrought havoc in the Middle West, interruption to the world-wide economic recovery and continued strikes join current business facts to emphasize Washington's dilemma.

Energy production has returned to 1930 levels at almost the high point for 1934. Carloadings lose part of the previously reported 2 per cent gain. Steel activity little changed. Automobile output curtailed. General indexes up slightly as commodity prices gain. Securities recovered somewhat from last week's precipitous decline, but the clouded outlook retarded even a full technical recovery.

Westinghouse Reports $1,744,427 Profit

Net profit in second quarter compares with net loss of $1,176,152 in previous quarter —Orders received increase 92 per cent.

Report of the Westinghouse Electric & Manufacturing Company for the second quarter of 1934 shows orders received to the amount of $33,655,022, compared with $20,237,588 for the previous quarter and $17,557,964 for the second quarter of 1933. Sales billed for the second quarter of 1934 totaled $27,287,545, against $17,994,045 for the previous quarter and $15,926,335 for the corresponding quarter in 1933.

Net profit for the quarter was $1,744,427, compared to net loss of $1,776,152 for the previous quarter and net loss of $2,078,424 for the corresponding quarter of 1933. Operations for the six months of 1934 show net loss of $31,725, compared to net loss of $5,569,996 for the first six months of 1933. Unfilled orders at June 30 were $31,892,155, as compared with $24,705,173 as of June 30, 1933.

"The encouraging improvement in business noted in our report for the first quarter of the year," stated President F. A. Merrick, "has continued through the second quarter. Orders received during the quarter ended June 30 show an increase of 92 per cent over the same quarter of 1933. Orders received during the six months ended June 30 show an increase of 77 per cent over the corresponding six months of 1933.

"Sales of practically all products have shown some improvement in recent months, but the major increases have been in seasonal lines, such as household refrigeration and other similar goods. There has not been a strong demand for machinery for production

purposes and other so-called capital goods.

"The electric public utility companies are not purchasing large machinery in any substantial quantities. If public utilities are able to secure the necessary funds for additions and betterments, it is reasonable to assume that there will be substantially increased purchases of Westinghouse material by this industry."

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American & Foreign Gets Extension on Loans

Loans totaling approximately $70,000,000 to the American & Foreign Power Company, a unit in the Electric Bond & Share system, have been extended for one year according to an announcement made by C. E. Calder, president of the company. A loan of $35,000,000 granted by Electric Bond & Share has been extended to Nov. 15. 1935. A $34,960,000 bank loan, including an $8,740,000 participation therein by Electric Bond & Share, was extended to Oct. 26, 1935.

American & Foreign Power repaid $3,200,000 in April and $1,840,000 on July 18 of its bank loan, reducing it from $40,000,000 to $34,960,000. The loan originally was $50,000,000. Electric Bond & Share's participation of $10,000,000 in the original loan has been reduced to $8,740,000. Funds for the loan repayments were obtained through financing by an American & Foreign subsidiary. The company's balance sheet as of March 31, 1934, shows cash in banks of $5,043,339.

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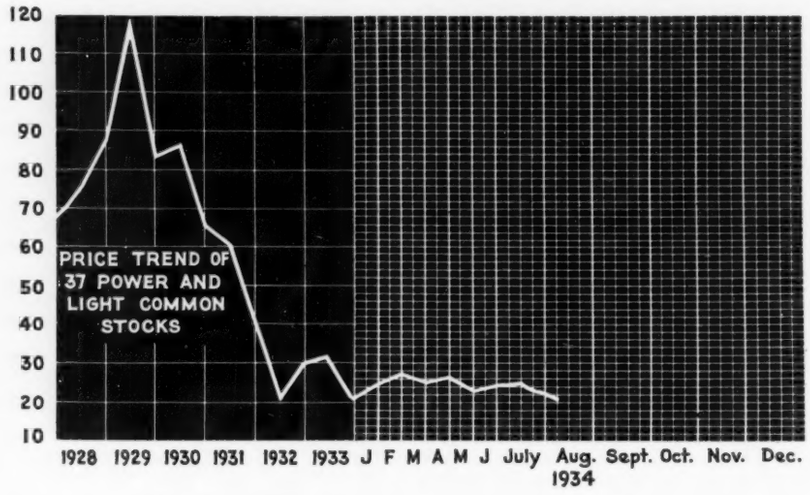
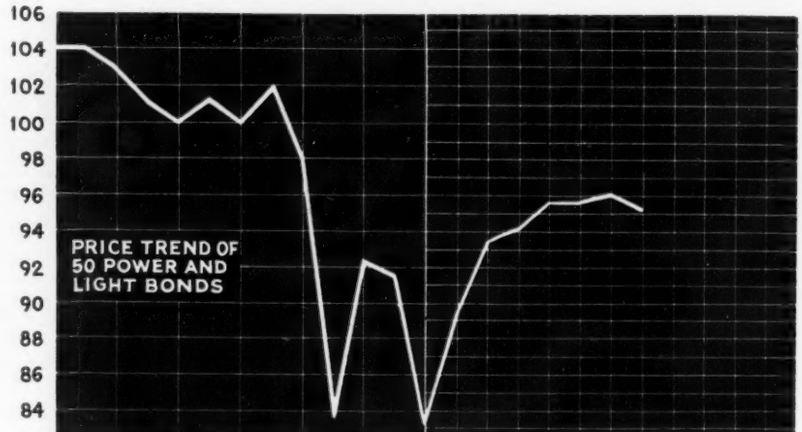
Sioux City Gas & Electric Wins Receivership Suit

Holding that the United States court in Delaware has full jurisdiction over the assets of the American Electric Power Corporation, Judge Miles W. Newby has dismissed the action brought in district court whereby W. J. Bertke was appointed receiver of the common stock of the Sioux City Gas & Electric Company, which is owned by the American Electric Power Corporation. The court also dismissed all other actions and court orders in the case, which was brought by a preferred-stock holder in the Sioux City company, who sued the American Electric Power Company, the Sioux City Gas & Electric Company and the Iowa Public Service Company, on the ground that American Electric Power, through its influence as owner of the common stock in the other two utilities, had maintained affairs to the detriment of the two Sioux City companies.

The American Electric Power Company is in bankruptcy and Judge Newby held that the district court had no jurisdiction.

Utility Bonds and Stocks Decline





Public utility bonds, failing to resist the general decline, sold off sharply in July. Utility stocks also lost ground during the week. *Electrical World* averages: Bonds, 95.6 July, 96.2 June; stocks 20.8 this week, the lowest point of the year; last week 22.2.

Associated Gas Decision Delayed by Court

Federal Judge Julian W. Mack, sitting at a hearing in New York this week, announced that he would grant a motion made by the Associated Gas & Electric Company to dismiss a petition filed by five creditors who sought a reorganization of the company, under the new bankruptcy law, unless within ten days an intervening petition should be filed. The petition was filed in Utica, N. Y., on June 8, the petitioners alleging that the company was insolvent.

Federal Judge Cooper in Albany was to have passed upon the case, but he withdrew in the face of an affidavit charging prejudice. The matter was then referred to the Circuit Court of Appeals and Judge Martin T. Manton appointed Judge Mack to decide it. The company moved to dismiss the petition on the ground that it failed to carry an allegation that any act in bankruptcy had been committed.

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Refrigerator Sales in 1934 Set New High Record

Sales of household electric refrigerators in the United States in the first half of this year, as reported by the Edison Electric Institute, set a new high record for the period with a total of 1,003,574 units. This total exceeds by 50.5 per cent the total for the first half

of 1933, when 666,750 units were sold. June unit sales reached the total of 190,003, compared with 213,420 in June, 1933. May, 1934, accounted for 277,988 units, which established a record in the industry for any month's sales.

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Leonard Brings Out Chest-Type Refrigerator

With the announcement of a new lift-lid, chest-type refrigerator to retail at $77.50, Leonard Refrigerator Company has just entered the new mass market for low-cost home equipment.

The new refrigerator, to be known as the Leonard "Electric Chest," is 32⅝ in. high, 27⅞ in. wide and 19 in. deep. Shelf area totals 4.3 sq.ft. and net volume is 2 cu.ft.

Features of the new model include an eight-position temperature selector that is located on the front of the cabinet; two freezing trays, producing 3.2 lb. of ice; a stainless porcelain bottom in the food compartment; a removable basket for the accommodation of fruit, eggs and vegetables; a white porcelain table top; a specially designed balloon door gasket that insures perfect sealing, and a patented door check that eliminates hinge strain. Standard Leonard mechanical equipment and Leonard-approved insulation are also used.

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Fairbanks, Morse Reports Profit in 1934

For the six months ended June 30 Fairbanks, Morse & Company reports net profit, after taxes, depreciation, interest and other charges, of $22,228, equal to 3 cents a share on 68,642 7 per cent cumulative preferred stock on which there are unpaid dividends, compared with net loss of $1,026,250 in the first half of 1933.

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Niagara Hudson Cuts Loans

Bank loans of the Niagara Hudson Power Corporation were reduced from $12,300,000 to $6,000,000 in the first six months of 1934, according to a statement made by Alfred H. Schoellkopf, president of the company. At the end of 1931 loans stood at $25,000,000.

New York Metal Prices

	July 24, 1934 Cents per Pound	July 31, 1934 Cents per Pound
Copper, electrolytic	9.00*	9.00
Lead, Am. S. & R. Price	3.85	3.75
Antimony	8.20	8.125
Nickel ingot	35.00	35.00
Zinc, spot	4.65	4.65
Tin Straits	51.95	52.10
Aluminum, 99 per cent.	23.30	23.30

*Blue Eagle.

SALES OPPORTUNITIES IN NEW CONSTRUCTION

Spot coverage of the week. Projects approved and proposed, bids requested, equipment wanted, funds available. Prospects for the electrical manufacturer.

Pine City, Minn.—Eastern Minnesota Power Company plans extensions and improvements in local steam-operated electric generating station, including installation of new equipment; also similar betterments and equipment at Diesel engine-generating plant at Milaca, Minn., and in transmission and distribution lines; old transmission lines will be replaced with new system equipment.

Burlington, N. C. — Asks bids until August 14 for new fire alarm system, including complete central station apparatus, about 14 miles copper wire, box units and equipment, etc. A. C. Linberg, consulting engineer.

Washington, D. C.—Bureau of Yards and Docks, Navy Department, asks bids until October 3 for new electrical distribution system for repair basin, Navy Yard, Pearl Harbor, T. H. (Specification 7604).

Decatur, Ill.—A. E. Staley Manufacturing Company plans installation of motors and controls, conveyors, etc., in new addition to soya bean oil mill and refinery. Cost close to $100,000.

Fort Morgan, Colo. — Has approved plans for extensions and improvements in city-owned electric light and power plant, including installation of turbo-generator unit and accessories. Cost about $75,000. Financing has been arranged through federal aid.

Los Angeles, Calif. — Water and Power Bureau, D. P. Nicklin, purchasing agent, asks bids until August 8 for 44,225 ft. 500,000-circ.mil, 5,000-volt, three-conductor, lead-covered, paper-insulated cable, 20,000 ft. No. 4 A.W.G., 600-volt, one-conductor cable, 21,000 ft. No. 4/0 A.W.G., 600-volt, one-conductor cable, 10,000 ft. No. 1/0 A.W.G., 600-volt, one-conductor cable, 3,000 ft. No. 6 A.W.G., 5,000-volt, three-conductor cable and 2,500 ft. No. 6 A.W.G., 5,000-volt, one-conductor cable, all lead-covered, paper-insulated (Specification 1455).

Fort Madison, Iowa — Mississippi River Power Company plans extensions in transmission line on Fourteenth Street to reach industrial plants for power service. Permission granted.

La Plata, Mo.—Plans early construction of new city-owned electric light and power plant, using Diesel engine-generating units, and electrical distribution system. Fund of $100,000 has been secured through federal aid. E. T. Archer & Company, Kansas City, Mo., consulting engineers.

Washington, D. C.—Board of District Commissioners, District Building, asks bids until August 9 for signal control equipment for traffic lighting system.

Cleveland, Ohio—Fisher Body Company plans installation of heavy-duty motors and controls, conveyors, hoists, etc., in new addition to automobile body works. Cost about $100,000.

Moodus, Conn. — Haddam Distillers Corporation plans extensions and improvements, including installation of new equipment. Company has arranged financing in amount of $288,750, considerable portion of fund to be used for purpose noted.

Los Angeles, Calif.—McCloskey Varnish Company, Philadelphia, Pa., plans installation of motors and controls, conveyors and other equipment in new branch plant in Maywood district, where 2-acre tract of land has been purchased. Cost about $140,000.

Pattonsburg, Mo.—Plans new city-owned electric light and power plant, and proposes early call for bids. Cost about $70,000. E. T. Archer & Company, Kansas City, Mo., consulting engineers.

Washington, D. C.—Bureau of Supplies and Accounts, Navy Department, asks bids until August 10 for Diesel engine-generating sets and spare parts (Schedule 2874).

Seattle, Wash. — Hemrich Brewing Company plans new multi-story addition to brewing plant. Cost about $100,000, with equipment.

Greenville, Miss.—United States Gypsum Company, Chicago, Ill., plans installation of motors and controls, conveyors, etc., in new addition to insulating board manufacturing plant, Greenville. Cost over $350,000.

New York, N. Y. — Department of Hospitals will have plans at early date for new addition to power plant at Bellevue Hospital, including improvements in present unit and installation of equipment. Fund of $1,148,000 has been secured through federal aid.

Lawrenceburg, Ind.—James Walsh & Company plans addition to distilling plant. Cost $300,000, with equipment.

Washington, D. C.—General Purchasing Officer, Panama Canal, asks bids until August 9 for one lighting unit, two air compressors, two centrifugal pumps, one air receiver, one electric drill, 100,000 ft. copper cable and other supplies (Schedule 2982).

Chicago, Ill. — Armstrong Paint & Varnish Works plans installation of motors and controls, conveyors, etc., in new multi-story addition; also will install coal-handling system for power house. Cost close to $60,000.

Aberdeen, Wash. — Columbia Breweries, Inc., Tacoma, Wash., is considering new branch brewing plant at Aberdeen. Cost about $115,000.

Mobile, Ala. — Continental Paper & Bag Corporation, New York, N. Y., plans installation of motors and controls, conveyors, hoists, etc., in new branch paper converting plant at Mobile. Cost over $100,000.

Coushatta, La.—Plans new city-owned electric light and power plant in conjunction with new waterworks station. Financing for $86,000 is being arranged through federal aid.

Chicago, Ill.—Signal Corps Procurement District, 1819 West Pershing Road, asks bids until August 14 for 185,299 to 370,598 dry batteries of various types (Circular 4).

MEN OF THE INDUSTRY

N. B. Hinson Chief Engineer of California Edison

N. B. Hinson, formerly assistant manager of operation of the Southern California Edison Company, has been appointed chief engineer and chairman of the engineering committee, to succeed the late Herbert A. Barre. Mr. Hinson became a member of the California Edison organization in 1906 as a test man in the Los Angeles test department. After serving in various ca-

pacities, he was made distribution engineer in 1913 and planning engineer in 1923. In this capacity he determined the needs for service and decided upon locations of substations, transmission lines and general system layouts. Six years ago he assumed the duties of assistant manager of operations.

R. G. Boyles, formerly superintendent of distribution, has been appointed assistant manger of operation, succeeding Mr. Hinson. Mr. Boyles entered the service of the company in 1906 as a service man in the Monrovia district. He became superintendent of distribution in 1926.

J. F. Hodges, formerly assistant superintendent of distribution, succeeds Mr. Boyles as superintendent of distribution. Mr. Hodges became a member of the company organization in 1905 as a district foreman in Porterville. He was made a division superintendent in 1925 and was appointed assistant superintendent of distribution in 1928.

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Robert H. Jameson has been appointed an assistant vice-president of the New England Power Association with headquarters at Boston. Mr. Jameson has been associated with the public utility industry in the northeast for the past 25 years. He is a graduate of Tufts College and 22 years ago went to Marlboro, Mass., as electrical engineer of the Marlboro Electric Company, a few years later becoming manager. Later he also became manager of the Marlboro-Hudson Gas Company. Both companies are subsidiaries of the Massachusetts Utilities Associates, which is affiliated with the New England Power Association.

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G. V. Rork New President Of Wisconsin Association

G. V. Rork, manager of the Wisconsin division of the Northern States Power Company, has been elected president of the Wisconsin Utilities Association. Mr. Rork is a native of Wisconsin. Early in his career he was connected with the Northern Pacific Railroad system in various branches of electrical work. He entered the employ of the Wisconsin-Minnesota Light & Power Company, now the Wisconsin division of the Northern States Power Company, in 1920.

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H. E. Markland has been appointed assistant domestic sales manager for Kelvinator Sales Corporation. Mr. Markland has been associated with Kelvinator for more than eight years.

Dr. Jordan W. Smith of Liverpool and John Murphy of Halifax have been appointed members of the Nova Scotia Power Commission by the provincial government.

Wendell L. Willkie has been elected chairman of the board of directors of Consumers Power Company, the Michigan operating unit of the Commonwealth & Southern Corporation.

Paul T. Buckler is now associated with the New York sales organization of the Riley Stoker Corporation, Worcester, Mass.

Frank W. Smith, president of the New York Edison Company and the United Electric Light & Power Company, has been elected a member of the board of trustees of the Northwestern Mutual Life Insurance Company of Milwaukee, Wis. Mr. Smith has been a policy holder of this company for many years and has participated in its committee work. He was a pioneer in advocating the investment of insurance company funds in carefully selected bonds of public utility companies.

Thomas J. Hickey has been appointed manager of the Marlboro Electric Company and the Marlboro-Hudson Gas Company, succeeding Robert H. Jameson. Mr. Hickey is a native of Worcester, Mass., and joined the Marlboro Electric Company in 1930 as sales manager. For the past year he has been acting manager of the company while Mr. Jameson has been detailed on special duty at Boston.

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R. J. Throckmorton Promoted by Virginia Utility

R. J. Throckmorton, for the past five years vice-president of the Virginia Electric & Power Company, with headquarters in Norfolk, has been transferred to Richmond to take charge of all electrical operations. Announcement concerning Mr. Throckmorton's promo-

tion followed the election of Joseph W. Bowes, vice-president of the Virginia utility in charge of operations in Richmond, to the position of president of the Western Public Service Company at Scottsbluff, Neb., another Stone & Webster property (Electrical World, July 21, page 98).

Mr. Throckmorton has been connected with the Virginia utility continuously since 1912, when he was graduated from the Virginia Military Institute with B.S. and E.E. degrees. The company at that time was known as the Virginia Railway & Power Company and Mr. Throckmorton became distribution engineer at Richmond. He served in that capacity until 1917, when he entered the World War.

After being relieved from active service he returned to the Virginia Electric & Power Company as distribution engineer at Norfolk, remaining in that position until 1923, when he was named superintendent of light and power of the Norfolk division. After three years he was appointed general superintendent of light and power with offices in Richmond. In less than a year Mr. Throckmorton was again advanced to the position of general manager of the electric department of the Richmond division. It was in 1929 that he assumed the executive duties of vice-president.

OBITUARY

HENRY P. F. WILKINS, formerly a member of the Marblehead (Mass.) Municipal Light Commission, died recently at a hospital in that town. He was chairman of the water and sewerage boards at the time of his death.

HARRY B. POPE, general superintendent of the electrical department of Montreal Light, Heat & Power Consolidated, died suddenly July 25 in the Montreal General Hospital. A native of Peterborough, Ont., Mr. Pope had been associated with the Montreal utility for 36 years. He was 55 years of age.

GEORGE H. VOIGT, for many years general counsel for Insull utilities, died July 26 in Jeffersonville, Ind., of complications which developed from injuries suffered in a motor accident. He was 75 years of age. An intimate friend of Samuel and Martin Insull, Mr. Voigt was one of the first investors in their Middle West companies. He abandoned general practice years ago to represent corporations exclusively.

LEONARD WHISTLER, assistant comptroller of the Niagara Hudson Power Corporation and treasurer of the Syracuse Lighting Company, was killed July 26 when his car left the road near Nedrow, N. Y. Mr. Whistler became associated with the Canadian Niagara Power Company in 1904 and after three years service at Niagara Falls, Ont., joined the Niagara Falls Power Company. In 1927 he took charge of the accounting department of the Northern New York Utilities, Inc., at Watertown, N. Y., staying there three years. After practicing as a public accountant he returned to Watertown to take charge of all accounting activities for distributing companies of the Northeastern Power group. He later became affiliated with the Niagara Hudson Corporation.

CHARLES A. VALLETTE, retired public utility operator and attorney, died in St. Louis, July 23, in his eighty-first year. A native of Cincinnati, Mr. Vallette studied law at Washington University, but before graduation entered the employ of the Missouri Edison Company. Some years later he established the first light and power plant at Edwardsville, Ill., which he sold to the McKinley Traction Company in 1906. He then went to Huntsville, Ill., where he opened a new plant. Subsequently selling this plant, he became credit manager for the General Electric Company in St. Louis. After obtaining his law degree at Benton College in 1914 he practiced in St. Louis for fifteen years before retiring. Mr. Vallette was one of the organizers of the Illinois State Electric Association in 1900.

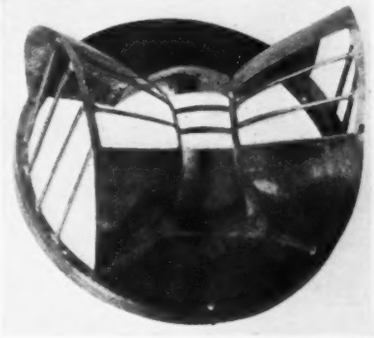
DR. WALTON CLARK, formerly president of the Franklin Institute of Pennsylvania and formerly vice-president of the United Gas Improvement Company, died July 30 at his home in Chestnut Hill, Pa., after a long illness. Entering the gas industry at the age of seventeen, Mr. Clark held positions with various properties before becoming identified with the United Gas Improvement Company in 1888, advancing to the position of vice-president of that company in 1903. Eleven years ago he retired as vice-president and was made consulting engineer. Dr. Clark was elected president of the Franklin Institute in 1907 and continued in that office for seventeen years. He was a past-president of the American Gas Light Association and of the American Gas Institute and was a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Society of Mining and Metallurgical Engineers and of other scientific bodies.

THEODORE KRONSHAGE, JR., chairman of the Wisconsin Public Service Commission, died in Milwaukee, Wis., July 29 in his sixty-fifth year. A native of Boscobel, Wis., Mr. Kronshage was a prominent figure in that state for many years. He was graduated from the University of Wisconsin, began his law practice in 1892, and subsequently became senior partner of the law firm of Kronshage, McGovern & Hannan. He served on the state Board of Education and was active in the League of Wisconsin Municipalities.

NEW EQUIPMENT

Guard Saves Street Lights

To protect street-light bulbs against stone-throwers a cast aluminum guard has been devised by General Electric Company and is now available for use with 14½-inch cast reflectors on a variety of luminaires.



General Electric

Two solid parabolic sections redirect the rays otherwise wasted on adjacent fields, thus enhancing the luminous intensity of the roadway. Though light in construction the guard is sufficiently strong to withstand the impact of objects thrown at bulbs with the intention of extinguishing the light.

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PORTABLE MEASURING INSTRUMENTS known as types NPD and NPA have been announced by the Roller-Smith Company, New York. In them are incorporated the refinements that are called for in certain exacting government specifications. The NPD line includes direct-current ammeters, voltmeters, millivoltmeters and milliammeters of all ranges. A companion line of NPA alternating-current instruments with the same size and style of case is offered also, so that it is possible for a laboratory to standardize on one size and type of portable for both alternating- and direct-current work.

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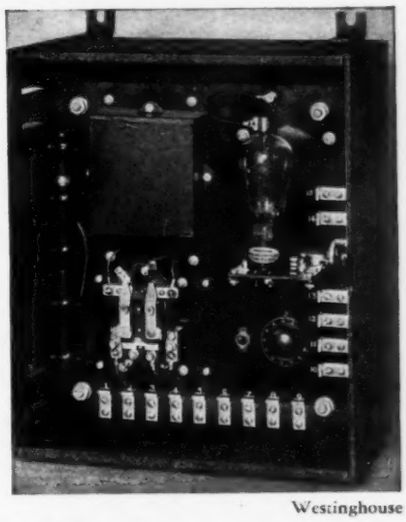
Register Cutter Regulator

A register cutter regulator for regulating high-speed cutting of paper, cellophane, cloth and similar materials in accordance with printed matter, labels



Westinghouse

or other patterns where both forward and reverse correction of the position of the material is required has been announced by the Westinghouse Electric & Manufacturing Company. The equip-

ment preferably is arranged to operate from phototubes, receiving impulses from a spot on the paper. Operation may be obtained also from contacts operated by a small perforation in the material or by a conducting section. Automatic register cutting control not only increases the output of machines, but also improves the accuracy of the operation and, therefore, improves the quality of the product. Production costs and wastage are reduced to a minimum.

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Portable Battery Chargers

To meet the demand for a compact motor-generator set of high capacity and minimum size a portable battery charger has been announced by the Century Electric Company, St. Louis, Mo. The motor is rated 20 hp., 220-440 volts, three phase, 60 cycles, low starting current, normal torque, squirrel cage, while the generator has a capacity of 300 amp., 45 volts and is compound wound with characteristics suitable for battery-charging service. Provision is made for charging either the 16-cell

Century Electric

lead acid battery or the 25-cell nickel alkaline battery, a two-value fixed resistor being mounted above the motor-generator set with a suitable knife switch on the control panel so that the charging characteristics can be readily adjusted for either type of battery.

This complete equipment is mounted on a steel truck and housed in a weatherproof steel inclosure with louvered sides and hinged doors at each end. The truck has roller wheels with 21 x 4-in. pneumatic tires.

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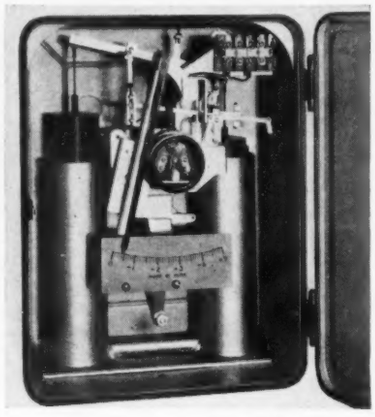
Control Trip Guards Against Explosive Mixtures

A control trip which withholds fuel feed until the boiler is thoroughly purged, and thus guards against explosive mixtures of fuel and air when lighting off pulverized coal, gas or oil fired boilers, has been announced by the Bailey Meter Company, Cleveland, Ohio. The mechanism consists essentially of two oil-sealed bells suspended from a beam to measure air flow through the boiler on the basis of draft loss through the boiler. The function is to operate the snap-acting contactor connected to the air flow mechanism by link-



Bailey Meter

age in such a manner that it is necessary to run the rate of air flow through the boiler up to approximately 60 per cent of capacity before the contactor snaps close and permits operation of the fuel feeder motor relay or control valve.

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Weatherproof, Dust-Tight Motor Starters

Weatherproof and dust-tight across-the-line motor starters, known as type ZO, available for use with motors up to and including 15 hp., 220 volts and 30 hp., 440 and 550 volts, have been announced by the Electric Controller & Manufacturing Company, Cleveland, Ohio.

The ZO starter is designed for severe service, it is especially small and compact and the oil-immersed feature permits high arc rupturing capacity and keeps the unit well lubricated and in good condition, being protected from

Electric Controller & Mfg.

moisture and corrosion by a thin film of oil deposited on the entire starter when it is in service. A self-contained ammeter can be furnished mounted and wired on top of the starter.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogues now available to engineers by manufacturers and associations.

How their various type of distribution cutouts are constructed and reloaded is shown in detail in a new 8-page bulletin (No. 215) of Schweitzer & Conrad, Inc., of Chicago. It is entitled **"Distribution Cutouts,"** discusses the fuse links and describes the Semafor type, the Positect Bayonet type and the heavy duty enclosed Type EB cutouts.

Engineering solutions of problems involved in **fitting motor truck ratings to utility transportation jobs** are contained in a 62-page booklet in the Reo Correspondence Course of Reo Motor Car Company, Lansing, Mich. Perforated answer pages may be returned to the publisher for verification and comment. Wheelbases (for truck and trailers), load distribution, torque, horsepower, gear ratio, pulling power, road speed, and costs are covered with supporting data supplied.

Ohmic resistances, current capacities and prices for vitreous enamelled rheostats and resistor units as well as an inexpensive Determohm to measure resistance are contained in an 8-page **catalogue (No. 10) of Ohmite Mfg. Co.,** 636 No. Albany Ave., Chicago. The various devices fall between the lower limit of 7 milliamperes maximum and an upper limit of 500 watts.

Characteristic properties, thickness ranges and appropriate product applications of **Synthane** (laminated Bakelite) are shown in a new booklet of Synthane Corporation, Oaks, Pa. Ten samples of five grades in natural and black are inserted in the booklet.

"Standards for Capacitors" (A.I.E.E. No. 18 and A.S.A. No. C55 of 1934) is the title of an A.I.E.E. 6-page standards release of a recently approved A.S.A. standard.

A **"Report on Standards for Acceptance Tests for Metal Tank Mercury Arc Rectifiers"** is an A.I.E.E. June release for circulation and comment preliminary to final adoption as an A.S.A. standard.

The Manhattan Rubber Manufacturing Division of Raybestos-Manhattan, Inc., of Passaic, N. J., has just issued **"Condor V-Belts, Engineering Data Book."** Its 55 pages are replete with tabulated and graphical data aiding the application of V-belts to motor drives. Belt section, horsepower, speeds, center distances and overload factors are correlated with a wide variety of application duties.

"Station Piping" (Publication No. B5 of Edison Electric Institute, 420 Lexington Avenue, New York, N. Y.) is a committee report on pipe experience, welded joints, high pressure and high temperature service as reported and commented upon by a large number of utility companies.